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ALL ABOUT PEPPER.

PEPPER.

(*From the "Encyclopædia Britannica,"* vol. xviii.)

Pepper, a name applied to several pungent spices known respectively as Black, White, Long, Red or Cayenne, Ashantee, Jamaica, and Melcgueta Pepper, but derived from at least three different natural orders of plants.

Black pepper is the dried fruit of *Piper nigrum*, L., a perennial climbing shrub indigenous to the forests of Travancore and Malabar, from whence it has been introduced into Java, Sumatra, Borneo, the Malay Peninsula, Siam, the Philippines, and the West Indies. It is one of the earliest spices known to mankind, and for many ages formed a staple article of commerce between India and Europe,—Venice, Genoa, and the commercial citics of central Europe being indebted to it for a large portion of their wealth. Tribute has been levied in pepper; one of the articles demanded in 408 by Alaric as part of the ransom of Rome was 3,000 lb. of pepper. Peppercorn rents prevailed during the Middle Ages, and consisted of an obligation to supply a certain quantity of pepper, usually 1 lb. at stated times; and the term still lingers in use at the present day. The price of the spice during the Middle Ages was exorbitantly high, and its excessive cost was one of the inducements which led the Portuguese to seek a sea-route to India. The discovery of the passage round the Cape of Good Hope led (1498) to a considerable fall in the price, and about the same time the cultivation of the plant was extended to the western islands of the Malay Archipelago. Pepper, however, remained a monopoly of the Portuguese crown as late as the 18th century. In Great Britain it was formerly taxed very heavily, the impost in 1623 amounting to 5s., and as late as 1823 to 2s. 6d., per lb.

The largest quantities of pepper are produced in Penang, the island of Rhio, and Johore near Singapore,—Penang affording on an average about half of the entire crop. Singapore is the great emporium for this spice in the East, the largest proportion being shipped thence to Great Britain. In 1880 the imports into England from Singapore amounted to 21,179,059 lb., valued at £385,108, and from other countries 559,909 lb. valued £12,979, the re-exports being 12,925,886 lb., chiefly to Germany, Italy, Russia, Holland and Spain. The varieties of black pepper met with in commerce are known as

Malabar, Aleppy or Tellicherry, Cochin, Penang, Singapore, and Siam. The average market value in the London market is– Malabar, 3½d. to 5½d. per lb. ; Penang, 2⅞d. to 4⅜d ; Singapore, 3⅛d. to 4¼d.

Pepper owes its pungency to a resin, and its flavour to a volatile oil, of which it yields from 1·6 to 2·2 per cent. The oil agrees with oil of turpentine in composition as well as in specific gravity and boiling point. In polarized light it deviates the ray, in a column 50 mm. long, 1°·2 to 3°·4 to the left. Pepper also contains a neutral crystalline substance, called piperin, to the extent of 2 to 8 per cent. This substance has the same empirical formula as morphia, $C_{12}H_{19}NO_3$, but differs in constitution and properties. It is insoluble in water when pure, is devoid of colour, flavour, and odour, and may be resolved into piperic acid, $C_{12}H_{10}O_4$, and piperidin, $C_5H_{11}N$. The latter is a liquid colourless alkaloid, boiling at 106° C., has an odour of pepper and ammonia, and yields crystallizable salts. A fatty oil is found in the pericarp of pepper, and the berries yield on incineration from 4·1 to 5·7 of ash. The only use of pepper is as a condiment. Notwithstanding its low price and the penalty of £100 to which the manufacturer, possessor, or seller of the adulterated article is liable, powdered pepper is frequently diluted with starch, sago, meal, and other substances, which can be readily detected under the microscope.*

In the south-west of India, where the pepper-plant grows wild, it is found in rich, moist, leafy soil, in narrow valleys, propagating itself by running along the ground and giving off roots into the soil. The only method of cultivation adopted by the natives is to tie up the end of the vines to the neighbouring trees at distances of at least 6 feet, especially to those having a rough bark, in order that the roots may easily attach themselves to the surface. The underwood is then cleared away, leaving only sufficient trees to provide shade and permit free ventilation. The roots are manured with a heap of leaves, and the shoots are trained twice a year. In localities where the pepper does not grow wild, ground is selected which permits of free drainage, but which is not too dry nor liable to inundation, and cuttings are planted at about a foot from the trees either in the rainy season in June or in the dry season in February. Sometimes several cuttings about 18 inches long are placed in a basket and buried at the root of the tree, the cuttings being made to slope towards the trunk. In October or November the young plants are manured with a mixture of leaves and cowdung. On dry soils the young plants require watering every other day during the dry season for the first three years. The plants bear in the fourth or fifth year, and if raised from cuttings are fruitful for seven years, if from seed for fourteen years. The pepper from plants raised from cuttings is said to be superior in quantity and quality, and this method is in

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* Hassal, *Food and its Adulteration* (1855), p. 42, and Evans, *Pharm. Journal* [2] i. p. 605.

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consequence most frequently adopted. Where there are no trees the ground is made into terraces and enclosed by a mud-wall, and branches of *Erythrina indica* are put into the ground in the rainy season, and in the course of a year are capable of supporting the young pepper plants. In the meantime mango trees are planted, these being preferred as supports, since their fruit is not injured by the pepper plant, while the *Erythrina* is killed by it in fourteen or fifteen years.

In Sumatra the ground is cleared, ploughed, and sown with rice, and cuttings of the vine are planted in September, 5 feet apart each way, together with a sapling of quick growth and rough bark. The plants are now left for twelve or eighteen months and then entirely buried except a small piece of bent stem, whence new shoots arise, three or four of which are allowed to climb the tree near which they are planted. These shoots generally yield flowers and fruits the next year. Two crops are collected every year, the principal one being in December and January and the other in July and August, the latter yielding pepper of inferior quality and in less quantity. Two or three varieties are met with in cultivation; that yielding the best kinds has broadly ovate leaves, five to seven in number, nerved and stalked. The flower-spikes are opposite the leaves, stalked and from 3 to 6 inches long; the fruits are sessile and fleshy. A single stem will bear from twenty to thirty of these spikes. The harvest commences as soon as one or two berries at the base of the spikes begin to turn red, and before the fruit is mature, but when full-grown and still hard; if allowed to ripen, the berries lose pungency, and ultimately fall off and are lost. The spikes are collected in bags or baskets and dried in the sun, on mats or hard ground, for two or three days. When dry the pepper is put into bags containing from 64 to 128 lb., and is then ready for the market. The yield varies in different localities. In Sumatra it is estimated at about 1½ lb. per plant per annum. In Malabar each vine gives 2 lb. a year up to the fifteenth or twentieth year, or about 24 lb. from each tree, a single tree sometimes supporting eight or twelve vines; an acre is calculated to bear 2,500 plants, to cost about £4 in outlay to bring it into bearing, and to yield a produce of £80 when in its best condition.

White pepper is obtained from the same plant as the black, and differs only in being prepared from the ripe fruits. These, after collection, are kept in the house three days and then bruised and washed in a basket with the hand until the stalks and pulpy matter are removed, after which the seeds are dried. It is, however, sometimes prepared from the dried black pepper by removing the dark outer layer. It is less pungent than the black but possesses a finer flavour. It is chiefly prepared at the island of Rhio, but the finest comes from Tellicherry. The Chinese are the largest consumers. In 1877 Singapore exported 48,461 piculs (a picul = 133⅓ lb.) to that country. The London market value is about 4⅝d. to 7d. per lb. White pepper affords on an average not more **than 1·9 per cent of** essential oil; but, according to Cazeneuve, **as much as 9 per** cent of piperin, and of ash not more than 1·1 **per cent.**

Long pepper is the fruit-spike of ***Piper officinarum***, C.D.C., and *P. longum*, L., gathered shortly before it reaches maturity and dried. The former is a native of the Indian Archipelago, occuring in Java, Sumatra, Celebes, and Timor. It has oblong, ovate, acuminate leaves, attenuated to the base, which are pinnate and veined. The latter is indigenous to Ceylon, Malabar, Eastern Bengal, Timor, and the Philippines; it is distinguished from *P. officinarum* by the leaves being cordate at the base and five-veined. Long pepper appears to have been known to the ancient Greeks and Romans under the name of πεπερι μακρὸν; and in the 10th century mention is made of long pepper, or macropiper, in conjunction with black and white peppers. The spice consists of a dense spike of minute baccate fruits closely packed around the central axis, the spike being about 1½ inch long and ¼ inch thick: as met with in commerce they have the appearance of having been limed. In Bengal the plants are cultivated by suckers, which are planted about 5 feet apart on dry rich soil on high ground. An English acre will yield about 3 maunds (80 lb.) the first year, 12 the second, and 18 the third year; after this time the yield decreases, and the roots are therefore grubbed up and sold as *pipli mul*, under which name they are much used as a medicine in India. After the fruit is collected which is usually in January, the stem and leaves die down to the ground. Long pepper contains piperin, resin, and volatile oil, and yields about 8 per cent of ash. Penang and Singapore are the principal centres in the East for its sale. In 1871 Singapore shipped 3,366 cwt., of which 147 were sent to Great Britain. Penang exports annually about 2,000 to 3,000 piculs. The value in the London market is from 37s. to 45s. a cwt.

Ashantee or *West African pepper* is the dried fruit of *Piper Clusii*, C.D.C., a plant widely distributed in tropical Africa, occuring most abundantly in the country of the Niam-niam. It differs from black pepper in being rather smaller, less wrinkled, and in being attenuated into a stalk, like cubebs, to which it bears considerable resemblance externally. The taste, however, is pungent, exactly like that of pepper, and the fruit contains piperin. It was imported from the Grain Coast by the merchants of Rouen and Dieppe as early as 1364, and was exported from Benin by the Portuguese in 1485; but, according to Clusius, its importation was forbidden by the King of Portugal for fear it should depreciate the value of the pepper from India. In tropical Africa it is extensively used as a condiment, and it could easily be collected in large quantities if a demand for it should arise.

Jamaica pepper is the fruit of *Pimenta officinalis*, Lindl., an evergreen tree of the Myrtle family. It is more correctly termed "pimento," or "allspice," as it is not a true pepper.

***Melegueta* pepper**, known also as "Guinea grains," "grains of **paradise**," or "alligator pepper," is the seed of *Amomum Melegueta*, Roscoe, a plant of the Ginger family; the seeds **are exceedingly** pungent, and are used as a spice throughout **central and** northern Africa.

PEPPER.

(*From "Spon's Encyclopædia."*)

Pepper (FR., *Poivre;* GER., *Pfeffer*). The name "pepper" is somewhat widely applied. The so-called "Cayenne" or "red" pepper has been described under Capsicums (see p. 1803). Two species of *Piper* will be found under Drugs, viz. Cubebs (p. 809), and Matico (p. 818): a third falls within the range of the articles on Drugs (Kava-kava, p. 815) and Narcotics (Ava, p. 1305); and two others are dealt with under Narcotics—Betel-pepper, p. 1305. There remain for description, as spices, the common black pepper, white pepper, long pepper, and Ashantee pepper.

1. *Black pepper.*—The plant (*Piper nigrum*) affording black pepper is a perennial climbing shrub, indigenous to the forests of Travancore and Malabar, and cultivated also in Sumatra, Java, Borneo, the Malay Peninsula, Siam, the Philippines, and the W. Indies. Several accounts have been published of the cultivation and harvesting of black pepper; they differ mainly in minor details, and may be summarized as follows:—

Where pepper-vines are found already growing, the forest is cleared of underwood, and sufficient trees only are left to provide shade, while permitting free ventilation, 6 ft. apart being considered a proper distance. The vines are trained up to the nearest trees, which are preferably 8-12 in. diam., for convenience in climbing when harvesting the fruit, all kinds of trees being apparently availed of indiscriminately. The root of the vine is manured with a heap of leaves, and the shoots are trained up twice annually. The vines live about 30 years, and are then replaced by others found growing wild around, or systematically planted. The pepper obtained from spontaneous plants is said to quite equal that grown in gardens, while the care necessary is almost nominal. A very wasteful plan sometimes adopted for manuring these natural pepper-plantations consists in setting fire to the trunks of very large trees, which are thus killed, and soon devoured by insects, becoming a heap of rotten dust, which gets washed by the rain around the roots of the vines.

In commencing a new plantation where vines are not to be found growing spontaneously, the first consideration is choice of site. Preference is to be given to level ground bordering rivers or streams, but not subject to inundation: slopes are to be avoided, unless very gentle; and plains will require deep ploughing and much manure. Propagation may be from cuttings and suckers, or from seed. The plants raised by the latter means are said to yield for 14 years, while those from the former are only fruitful for 7 years, but their crops are superior in both quantity and quality, consequently the planting of suckers or cuttings is most generally adopted. The next consideration will be the kind of tree to plant as a support and shade for the vines. Where trees are growing on the ground to be planted with pepper, preference is given to the mango (*mangifera indica*), whose fruit is not injured by the development of the pepper-vine; failing this, recourse may be had to the jak (*Artocarpus integrifolia*) whose fruit, however, is said to be diminished in quantity and injured in quality by the presence of the pepper. When it is necessary to plant trees, choice is made of the *Erythrina indica* as a large branch of it put into the ground in the rainy season will be capable of supporting the vine in the course of a year; mango-trees may then be raised meantime, as 6-15 years' bearing of the vines suffices to kill the *Erythrinas*. In commencing a plantation upon *Erythrinas*, the ground is usually fenced with a mud wall, and made into terraces. Between mid-July and mid-November, the ground is deeply hoed and set out with plaintains at about 12 paces apart; between the first week in February and first in March, branches of *Erythrina* 6-12 feet. long are planted at 60 paces apart, and watered till the rainy season sets in. Between May 10 and June 10, the pepper-vines are planted, which may be done in several ways. One plan is to put ½-doz. cuttings each 18 in. long into a basket, which is filled with earth, and buried at the foot of the tree, with the cuttings sloping towards it. Between mid-October and mid-November, the ground around the basket is dug, and the vines are manured with cow-dung and dead leaves. The baskets are said to be a great protection to the plants in their early life, but are often omitted. In either case during the dry seasons of three years after planting, the vines need watering, in favourable soils, once in 3 days; in dry soils, on alternate days. Between mid-October and mid-November they are manured, and are trained up to the tree till 6 ft. high, after which they are self-supporting. After the third year, the plantains are dug up; and then this manuring and hoeing of the ground is performed twice annually, viz., between mid-October and mid-November, and between mid-July and mid-August. The vines produce in 4-5 years, and are in full bearing in the 6th or 7th, continuing to yield for 12-14 years, when the *Erythrinas* die. In some cases, the trees supporting the vines are pruned, and their branches are lopped; in others, the leaves only are thinned. Mango-trees should be at least 20 years old before having to support the vines.

The Sumatran mode of cultivation differs considerably. The ground is cleared, ploughed, and sown with rice; cuttings of the vine are then planted 5 ft. apart each way, with a sapling of some tree of quick growth and rough bark, in September. The vines are left alone for 12-18 months, then entirely buried, except a small surface of the bent stem, whence spring new shoots, 3-4 of which are allowed to climb the tree planted with them, and are expected to give flowers and fruits a year later. There are two crops annually, the first in December-January, the second in July-August; the latter is much inferior in both quantity and quality.

The yield of the plantations varies somewhat according to circumstances. In Sumatra, the dual crop is estimated to average 1½ lb. from each vine per annum. In Malabar, each vine gives a mean of 2 lb. a year up to the 15th-20th year, or about 24 lb. for each tree, which may support 8-12 vines. Sometimes 8-10 lb. is got from a single vine. An acre is reckoned to bear 2,500 plants, and to cost not more than 4*l.* to bring into bearing, while yielding a produce worth about 80*l.* when in full bearing, The fruits grow in masses of 20-30 on a single stem. The harvest takes place when they are full-grown and hard, but before they mature, in which latter state they lose pungency and fall off. The season for gathering falls between mid-December and mid-February. The bunches *(amenta)* are hand-plucked in bags or baskets, and the berries (pepper) are then detached from the stem by rubbing with the hands or feet on a mat. The sound berries are then sun-dried for 2-3 days, in a single layer, either on mats or on a patch of smooth ground, being collected in earthen jars at night away from the dew. Mat-drying is said to give a heavier return than ground-drying. The dry pepper is put up in mat bags of 64-128 lb., and is ready for the market.

Whole black pepper is seldom or never adulterated in Europe; but in India, the berries of *Embelia [Samara] Ribes*, are often mixed with the spice for sale in the bazaars. Ground pepper, on the other hand, is frequently sophisticated with starches and other matters detectable with the microscope, despite the very heavy penalty (100*l.*) which has been in force since 1819. The approximate London market values of black pepper are:—Malabar, 3½-5½*d.* a lb.; Aleppy and Tellicherry, 3½-5½*d.*; Penang, 2⅞-4⅜*d.*; Singpore, 3⅛-4¾*d.*

2. *White Pepper.*—This is produced by the same plant as the black pepper, and is prepared by allowing the berries to ripen, keeping them for 3 days in the house after gathering, washing and bruising them in a basket with the hand till the stalks and pulp are removed, and then drying the white seeds. It is said that the lives of the vines are endangered by allowing the fruit to ripen on them. Sometimes white pepper is prepared from black by removing the dark outer layer of pericarp. The article is most largely prepared in the Straits, but the finest is produced in Tellicherry. China is the great market for it. Singapore exported 48,460 *piculs* (of 135⅓ lb.) in 1877. In 1879, Hankow imported 250 *piculs*, 885*l.*; Ningpo, 238 *piculs*, Shanghai, 357 *piculs*. The London market value of white pepper is about 4-⅜7*d.* a lb.

3. *Long Pepper.*—This is the fruit-spike of *Piper longum [Chavica Roxburghii]* and of *P. [C.] officinarum*, collected and dried shortly before it reaches maturity. The latter is a native

of the Indian Archipelago (Java, Sumatra Celebes, and Timor). The former is indigenous to Malabar, Ceylon, E. Bengal, Timor, and the Phillipines, and is cultivated along the E. and W. coasts of India. In Bengal, the plants are raised from suckers set 5 ft. apart in rich, high, dry soil. The yield from an acre is 3 *maunds* (of 80 lb.) in the 1st year, 12 in the 2nd, 18 in the 3rd; after this, the return diminishes, and the roots are grubbed up, dried, and sold as *pipli-mul*. The pepper is harvested in January, and thoroughly sun-dried. It is brought from Java and Rhio to Singapore and Penang for re-export. Singapore shipped 3,366 cwt. in 1871, 447 being to the United Kingdom. Penang despatches 2,000-3,000 *piculs* (of 135½ lb.) yearly. The London market value is 37-45s. a cwt.

4. *Ashantee or W. African Pepper.*—This spice, sometimes called also "After cubebs," is the fruit of *Piper* [*Cubeba*] *Clusii*, widely distributed in Tropical Africa, most abundantly in the Niam-niam country, about 4° to 5° N. lat. and 28° to 29° E. long. It is locally used as a substitute for common black pepper, and could be procured in large quantity.

PEPPER.

(*From Simmond's Commercial Products of the Vegetable Kingdom.*)

The black pepper of commerce is obtained from the dried unripe fruit (drupes) of *Piper nigrum*, a climbing plant common in the East Indies, and of the simplest culture, being multiplied with facility by cuttings or suckers. The ripe fruit, when deprived of its outer fleshy covering by washing, forms the white pepper of the shops. The dried fruiting spikes of *P. longum*, a perennial shrub, native of Malabar and Bengal, constitute long pepper. The fruit of *Xylopia aromatica* is commonly called Ethiopian pepper, from being used as pepper in Africa The seeds of some species of fennel-flower (*Nigella sativa* and *arvensis*), natives of the South of Europe, were formerly used instead of pepper, and are said to be still extensively employed in adulterating it. In Japan, the capsules of *Xanthoxylum piperitum*, or *Fagara piperita*, are used as a substitute for pepper, and so is the fruit of *Tasmannia aromatica* in Van Dieman's Land. According to Dr. Roxburgh, *P. trioicum* is cultivated in the East, and yields an excellent pepper.

The pepper vine rises about two feet in the first year of its growth, and attains to nearly six feet in the second, at which time, if vigorous and healthy, the petals begin to form the corolla or blossom. All suckers and side shoots are to be carefully removed, and the vines should be thinned or pruned, if they become bushy at the top. Rank coarse weeds and parasitical plants should be uprooted. The vine would climb, if permitted, to the elevation of twenty feet, but is said to bear best when kept down to the height of ten or twelve feet. It produces two crops in the year. The fruit grows abundantly from all the branches, in long small clusters of from 20 to 50 grains; when ripe it is of a bright red color. After being gathered, it is spread on mats in the sun to dry, when it becomes black and shrivelled. The grains are separated from the stalks by hand-rubbing. The roots and thickest parts of the stems, when cut into small pieces and dried, form a considerable article of commerce all over India, under the name of *Pippula moola.*

Almost all the plants of the family *Piperaceæ* have a strong aromatic smell and a sharp burning taste. This small group of plants is confined to the hottest regions of the globe: being most abundant in tropical America and in the East Indian Archipelago, but more rare in the equinoctial regions of Africa. The common black pepper, *P. nigrum*, represents the usual property of the order, which is not confined to the fruit, but pervades, more or less, the whole plant. It is peculiar to the torrid zone of Asia, and appears to be indigenous to the coast of Malabar, where it has been found in a wild state. From this it extends between the meridians of longitude 96 deg. and 116 deg. S. and the parallels of latitude 5 deg. S. and 12 deg. N., beyond which no pepper is found. Within these limits are the islands of Sumatra and Borneo, with the Malay peninsula and part of Siam. Sumatra produces by far the greatest quantity of pepper. In 1842, the annual produce of this island was reckoned at 30,000,000 lbs., being more than the amount furnished by all the other pepper districts in the world.

A little pepper is grown in the Mauritius and the West India Islands, and its cultivation is making some progress on the Western Coast of Africa, as we imported from thence 2,909 bags and casks in 1846, and about 110,000 lbs. in 1847.

Mr. J. Crawfurd, F.R.S., one of the best authorities on all that relates to the commerce and agriculture of the Eastern Archipelago, estimated recently (about 1850) the produce of pepper as follows:—

	lb.
Sumatra (West Coast)	20,000,000
" (East Coast)	8,000,000
Islands in the Straits of Malacca	3,600,000
Malay Peninsula	3,733,333
Borneo	2,666,667
Siam	8,000,000
Malabar	4,060,000
Total	50,000,000

If we add to this

Western Coast of Africa and B. W. Indies ..	53,000
Java	4,000,000
Mauritius and Ceylon	80,000
It gives	54,133,000

as the total produce of the world.

Black pepper constitutes a great and valuable article of export from the Indian Islands; which, as we have seen, afford by far the largest portion of what is consumed throughout the world. In the first intercourse of the Dutch and English with India, it constituted the most considerable and important staple of their commerce. The production of pepper is confined in a great measure to the western countries of the Eastern Archipelago, and among these to the islands in the centre and to the northern quarter, including the Peninsula. It is obtained in the ports on both sides of the coast of the latter, but particularly the north-eastern coast. The principal quarters (according to Mr. Crawfurd, my authority on this subject) are Patani, Tringanu, and Kalantin. In the Straits a large quantity is produced in the island of Singapore, and above all in Pinang, where the capital of Europeans, and the skill and industry of the Chinese have been successfully applied to its culture. The Western extremity of Sumatra, and the north-west coast of that island, are the most remarkable situations in it for the production of pepper, and here we have Acheen, Tikao, Bencoolen, Padang, and the country of the Lampungs. The production of the eastern extremity of Sumatra or Palembang is considerable, but held of inferior quality. In the fertile island of Java, the quantity of pepper grown is inconsiderable, nor is it remarkable for the goodness of its quality.

The south, the west, and the north coasts of the great island of Borneo produce a large quantity of pepper: as early as 1721 it was a staple commod'ty of this island. Banjarmassin is the most productive place on the south coast, and the State of Borneo Proper on the north coast. The best pepper certainly does not grow in the richest soils, for the peppers of Java and Palembang are the worst of the Archipelago, and that of Pinang and the west coast of Sumatra are the best. Care in culture and curing improves the quality, as with other articles, and for this reason chiefly it is that the pepper of Pinang is more in esteem than that of any other portion of the Archipelago. From the ports and districts of Siam 3,500 to 4,000 tons are exported annually.

The pepper vines, which are allowed to climb poles or small trees, are tolerably productive at Singapore; and pepper planting is esteemed by the Chinese to be a profitable speculation, particularly if they are enabled to evade the payment of quit-rent. An acre of pepper vines will yield 1,161 lbs. of clean pepper. In Sumatra a full grown plant has been known to produce seven pounds; in Pinang the yield is much more. The average produce of one thousand vines is said, however, to be only about 450 lbs.

Colonel Low, in his "Dissertation on Pinang," published at Singapore some years ago, gives an interesting account of the culture :—

"Pepper was, during many years, the staple product of Pinang soil, the average annual quantity having been nearly four millions of pounds; but previous to the year 1810, the above amount had decreased to about two-and-a-half millions of pounds, which was the result of the continental system, The price having fallen at length to three and three-and-a-half dollars the picul—with only a few occasional exceptions of rises—the cultivation of this spice was gradually abandoned, and the total product at this day does not exceed 2,000 piculs. The original cost, when pepper was at a high price, together with charges of transporting it to Europe, amounted to £36,357 for every five hundred tons, and the loss by wastage was estimated at £5,405. In 1818 there remained on the island 1,480,265 pepper vines in bearing, and the average value of exports of pepper from Pinang, including that received from other places, was averaged at 106,870 Spanish dollars.

As might have been foreseen, the fall of prices has so greatly diminished the cultivation of pepper to the eastward, that a reaction is likely to take place; and has in fact partly shown itself already. Some Chinese in Pinang and Province Wellesley seem to be preparing to renew the cultivation. There is abundant scope for the purpose on both sides of the harbour, and every facility is at hand for carrying it on.

The pepper plant or vine requires a good soil, the richer the better, but the *red* soil of higher hills is not congenial, the Chinese think, to it. The undulations skirting the bases of the hills, and the deep alluvial lands, where not saturated with water, or liable to be overflowed, are preferred.

The Chinese have always been the chief cultivâtors, and when the speculation flourished they recived advances from the merchants, which they paid back in produce at fixed rates

When pepper was extensively cultivated on Prince of Wales Island, the European owner of the land had the forest cleared by contract, and the vines planted by contract, and when the vines came into bearing the plantation was farmed to the Chinese from year to year, on payment of a specific quantity of pepper. Any other plan would have ruined the capitalist, as the culture is almost entirely in their hands in the Straits Settlements, and they will not work so well for others as when they are specially interested.

The plants are set out at intervals, *every way*, of from seven to twelve feet, according to the degree of fertility of the soil, so that there are from 800 to 1,000 vines in one orlong of land; to each vine is allotted a prop of from ten to thirteen feet high, cut from the thorny tree called *dadap*, or where that is scarce, from the less durable *boonglai*; there props take root, thus affording both shade and support to the plant. The plant may be raised from seed pepper, but the plan is not approved of, cuttings being preferable, as they soonest come into bearing. The pits in which these cuttings are set should be a foot-and-half square, and two feet in depth; manure is not often applied, and then it is only some turf ashes. However unpicturesque a pepper plantation may be, still its neat and uniform appearance renders the landscape lively, and there can be little doubt that the island has suffered in its salubrity since the jungle usurped the extensive tracts formerly under pepper cultivation.

When the vine has reached the height of three or four feet, it is bent down and laid in the earth, and about five of the strongest shoots which now spring up are retained and carefully trained up the prop, to which they are tied by means of ligatures of some creeping plants.

One Chinese, after the plantation has been formed, can take care of two orlongs of land. The usual mode is this:—An advance is made by the capitalist to the labourer for building a house, and for agricultural implements; he then receives two dollars monthly to subsist on, until the end of the third year, when the estate or plantation is equally divided betwixt the contracting parties.

The Chinese and even European cultivators used formerly to engage the Chinese who had just arrived from China: they paid off their passage money, and then allowed them two dollars monthly for provisions, for one year, with a suit of clothes, by which means the cost of the labor of one man averaged about three dollars monthly: but the plan is attended with risks.

The cost attendant on the cultivation of two orlongs of land, with pepper, for three years—the Chinese laborer receiving the usual hire of *five* Spanish dollars monthly—will be nearly as follows:—

	Spanish dollars
Price of land, clearing, and planting	40
Quit rent, at 75 cents per annum per orlong ..	9
Two thousand plants	4
,, dadap props	6
Implements	6
House	10
Labor	200
Interest, loosely calculated at	30
Total Spanish dollars ..	305

In a very good soil a pepper vine will yield about one-eighth of a pound of a dry produce at the end of the first year; at the end of the second, about a quarter of a pound; and at the expiration of the third, probably one pound, at the end of the fourth, from three to three-and-a-half pounds; ditto fifth, from eight to ten pounds. After the fifth year up to the fifteenth, or even the twentieth year, about ten pounds of dry merchantable produce may be obtained from each vine, under favorable circumstances. The Chinese speculator used to rent out his half-share of a new plantation for five years, to his cultivating partner, after the expiration of the first three years, at the rate of thirty piculs per annum; the total produce of these five years giving about fifty-six piculs annually as an average.

A pepper plantation never survives the thirtieth year, unless in extremely rich soil, and then it is unproductive, nor will the young vine thrive on an old worn out pepper land, a peculiarity which is applicable to the coffee tree. The chief crop lasts from August to February. Four pounds of dry produce, for ten of green, is considered a fair estimate. Great care is requisite in management of the vine, and especially in training and tying it on the props. It is subject to be injured by the attacks of a small insect. The green pepper dries in two or three days, and if it is intended that it shall be black, it is pulled before it is quite ripe. To make white pepper, the berry is allowed to remain somewhat longer on the vine; it is, when plucked, immersed in boiling water, by means of which process and subsequent friction, before drying, the husk is separated.

CHILLIES AND CAYENNE PEPPER.

Chillies or capsicum are long roundish taper pods, divided into two or three cells, full of small whitish seeds. When this fruit is fresh, it has a penetrating acrid smell; to the taste it is extremely pungent, and produces a most painful burning in the mouth. They are occasionally imported dry, and form the basis of Cayenne pepper; put in vinegar when green or ripe, they are an acceptable present in Europe. In Bengal the natives make an extract from the chillies, which is about the consistence and color of treacle.

The consumption of chillies in India is immense, as both rich and poor daily use them, and it is the principal ingredient in all chutnies and curries ground into a paste, between two stones, with a little mustard, oil, ginger and salt, it forms the only seasoning which the millions of poor in that country can obtain to eat with their insipid rice. They are worth in the Bombay market about 40s. the candy of 600 lbs.

Immense quantities of the capsicum are used by the native population of the West Indies, Africa, and Mexico, the consumption as a condiment being almost universal, and perhaps equal in quantity to salt. Ten barrels of these peppers were shipped from Montego Bay, Jamaica, in the first six months of 1851.

The wholesale price of chillies in the London market is from 15s. to 25s. the cwt., and there is a duty of 6d. per pound on them. Cayenne fetches 9d. to 2s. the pound.

Chilli is the Mexican name for all varieties of *Capsicum.* They are natives of the East and West Indies, and other hot climates. *C. annum* is the species commonly noticed, but there seems to be numerous varieties, which by many are reckoned spices. Thus, *C. frutescens* is a shrubby plant, which, along with *C. minimum,* supplies the variety called bird-pepper, it grows to a larger and more bushy size; *C. baccatum* has a globular fruit, and furnishes cherry or berry capsicum. They are all of the simplest culture, and may even be grown with very little care in England. Culture appears to increase the size, but to diminish the pungency of the fruit. In capsicums irritant properties prevail so as to obscure the narcotic action. Their acridity is owing to an oleaginous substance called capsicin. Cayenne pepper is used in medicine chiefly in the form of tincture, as a rubefacient and stimulant, especially in cases of ulcerated sore throat. It acts on the stomach as an aromatic condiment, and when preserved in acetic acid it forms chilli vinegar.

Red pepper may be considered one of the most useful vegetables in hygiene. As a stimulant and auxiliary in digestion it has been considered invaluable, especially in warm countries. A kind called the tobacco red pepper, is said to possess the most pungent properties of any of the species. It yields a small red pod, less than an inch in length, and longitudinal in shape, which is so exceedingly hot that a small quantity of it is sufficient to season a large dish of any food. Owing to its oleaginous character, it has been found impossible to preserve it by drying, but by pouring strong boiling vinegar on it a sauce or decoction can be made, which possesses in a concentrated form all the essential qualities of the vegetable. A single drop of this sauce will flavor a whole plate of soup or other food.

The "wort" or Cayenne pottage may be termed the national dish of the Abyssinians, as that, or its basis "dillock," is invariably eaten with their ordinary diet, the thin crumpet-like bread of teff or wheat flour. Equal parts of salt and the red cayenne pods are well powdered and mixed together with a little pea or bean meal to make a paste. This is called "dillock," and is made in quantities at a time, being preserved in a large gourd-shell, generally suspended from the roof. The "wort" is merely a little water added to this paste, which is then boiled over the fire, with the addition of a little fat meat and more meal to make a kind of porridge, to which sometimes is also added several warm seeds, such as the common cress or black mustard, both of which are indigenous in Abyssinia.—("Johnston's Abyssinia.")

A great quantity of Agri or Guinea pepper is grown in Peru, the natives being very fond of this condiment. It is not uncommon for an American Indian to make a meal of twenty or thirty pods of capsicum, a little salt, and a piece of bread, washed down by two or three quarts of chica, the popular beverage.

PEPPER.

(*From "Porter's Tropical Agriculturist."*)

Pepper vine—*Piper nigrum* -belonging to a genus of the class and order *Diandria Trigynia.*

The pepper-plant is indigenous to both the Indian peninsulas. It grows most abundantly on the coast of Malabar, whence pepper forms a considerable export. Java, Sumatra, and Borneo likewise produce it in large quantities.

The Dutch, with that grasping policy which has always characterized the management of their Eastern possessions, long strove to monopolize the whole of the pepper trade; and, to forward their views, forced its cultivation in Java with an avidity which defeated its own purpose. Sir Stamford Raffles, in his excellent History of Java, observes on this subject, that "Pepper which at one time formed the principal export from

Java, has, for some time, ceased to be cultivated to any considerable extent. It was reared principally in Bantam and the dependencies of that province in the southern part of Sumatra: and, in the flourishing state of the monopoly, these districts furnished the Dutch with the chief supply for the European market. But the system by which it was procured was two oppressive and unprincipled in its nature, and too impolitic in its provisions, to admit of long duration. It was calculated to destroy the energies of the country, and with them the source whence the fruits of the monopoly proceeded. In the year 1811, accordingly, neither Bantam nor its dependencies furnished the European government with a single pound of this article."—Vol i. p. 131.

A more enlightened system has, however, for the last few years been pursued with regard to the cultivation of pepper in Java. It is no longer engrossed as a government monopoly, and perfect freedom is allowed in the raising of this production.

When the East India Company first formed a settlement on the coast of Sumatra, its attention was directed to procure an extensive growth of pepper. For this end a stipulation was made with some of the native chiefs, binding them to compel their subjects each to cultivate a certain number of pepper vines. The whole of the produce obtained from these plants was to be delivered exclusively to the Company's agents at a price far below what would constitute a proper remuneration for the labour bestowed on its cultivation and preparation.* The authority of the chiefs for a while enforced obedience to this arbitrary measure; and their interest in causing its continuance was supposed to be sufficiently engaged by granting them an allowance proportionate to the quantity of pepper delivered. This gross oppression was, however, too keenly felt to be willingly endured; and accordingly, as the influence of the chiefs declined, the people relaxed in their exertions, and the annual supply fell off the natives refusing to work on such unjust terms. The chiefs, unable any longer to obtain acquiescence in their despotic behests, abandoned to the agents of the Company the task of obliging the people to labour, that others might reap; and as long as an efficient establishment was kept up, this work of oppression continued successful, inasmuch as the stipulated number of vines were still cultivated, and the usual consignments made to Europe.

Happily the rights of others are now better understood and respected, and the impolicy, as well as the injustice of such measures, are fully acknowledged. The pepper of Sumatra is no longer obtained by oppressing the natives, and its cultivation is declared free.

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* The price which was for many years paid to the cultivators of pepper was ten Spanish dollars, or fifty shillings, per bahar (5 cwt). About 1780 the price was augmented to fifteen dollars. Duty in addition paid to the chiefs was from one and a half to two dollars per bahar. This low price afforded to each cultivator an income of not more than from eight to twelve dollars.—Marsden's Sumatra.

The cultivation of the pepper plant has been successfully pursued in the Western hemisphere. We learn from "La Guiane Francaise" of 5th February, 1825, that it was a few years since introduced at Cayenne, and followed up with uncommon perseverance by General Bernard. Commenting on this circumstance, the writer in the publication just named, remarks: "The results give reason to hope that the time is not very far distant when France will be delivered from the tribute which she pays to foreigners for the supply of this spice. More than thirty thousand pepper-trees are about to enter into bearing on the estate of the estimable settler whose efforts we admire, and each pepper-tree promises to furnish for exportation from four to five kilogrammes of pepper."

The berries of the *piper nigrum* are the black and white pepper of commerce. This is a perennial plant, with a creeping or climbing stem of a dark colour, which soon becomes ligneous, and acquires considerable thickness. The leaves are heart-shaped and pointed, with a glossy surface, and of a dark green colour. They have very little smell or pungency. The branches are short and brittle, not projecting above two feet from the stem, and separating readily at the joints. Clusters of small white flowers are succeeded by round berries, green when young, and turning to a bright red as they arrive at maturity. They grow abundantly upon all the branches, from which they hang in large bunches, resembling, in form, clusters of grapes; but the berries grow distinct, and more in the manner of currants or elder-berries.

This plant thrives luxuriantly in most soils, and, when once reared, requires comparatively little care and labour. The preference, in choosing a situation, is usually given to level grounds along the banks of rivers (provided they are not so low as to be inundated), on account of the rich vegetable mould found in those localities, and for the advantage of water carriage. Plantations of this tree are seldom made on rising ground, unless the ascent be very gentle; otherwise the soil is liable to be loosened and washed away from the roots of the vines. The goodness of pepper is considered to depend more upon the natural qualities of the soil than upon the care bestowed on its cultivation. It is a hardy tropical plant and grows readily from cuttings or layers, rising in several knotted stems, which cling round any neighbouring support, and adhere to it by means of fibres that shoot from every joint at intervals of from six to ten inches, and through which it probably imbibes its nourishment. If left without any means of climbing upwards, the stalk, unable to support itself, creeps along the ground. The fibres at the joints then become roots, but in this situation "the plant would never exhibit signs of fructification."*

Like ivy, it is encouraged by support to throw out bearing shoots. If left in its natural state it climbs to twenty or five-and-twenty feet high; but it is more fruitful when not allowed to attain this height. Restrained in its growth, to from twelve to fifteen feet high, it bears both foliage and flowers within a foot of the ground; but in the former case, the lower part of the stem is entirely devoid of these.

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* Marsden's Sumatra.

In order to give to the pepper-vines the support they require, it is usual to plant some other trees with them for that purpose. The Jacca tree—*(Artocarpus integrifolia)* is selected in Malabar thus to lend its support, since the same soil is equally well adapted to the growth of both plants. In Sumatra a thorny tree, called by the natives chingkariang. *(erythrina corallodendron)* is employed. In Borneo the vines are supported like hops by poles; but there is a great disadvantage attendant on this method, as the poles thus exposed decay at the end of two or three years, while the plants last many years, and they are much injured in the removal of the old poles, and the placing of new ones. Besides this, the use of poles has another disadvantage in the absence of foliage, which during the dry season is of service in sheltering the vines from the too ardent rays of the sun.

When a piece of ground is to be converted into a pepper plantation, it is marked out by means of a line into regular squares, having their sides about six feet, the intervals at which the plants are intended to be placed from each other. The points of intersection are noted by slight stakes, and at each of these points a tree intended for the prop is planted; for this purpose cuttings of about two feet long are put into the ground a span deep; sometimes cuttings six feet long are used, but these often fail, are not so rigorous as shorter ones, and generally grow crooked.

When the shoots of the chinkariang are twelve or fifteen feet high, a height they usually attain during the second year of their growth, they are topped, and not allowed to grow much beyond this altitude. The branches are lopped annually at the commencement of the rainy season in November, leaving little more than the stem, or otherwise the droppings from the leaves might injure the vines.

The usual mode of propagating the pepper-plant is by cuttings of a foot or two in length taken from the horizontal shoots, which spring forth from the foot of the old vines. One or two of these cuttings are planted close to the young chinkariang tree, sometimes as soon as the latter has taken root, but oftener after a lapse of six months from its first being planted—a few cultivators allow an interval of twelve months, fearful lest the growing vine should overpower its support; but in general, if this be a healthy and vigorous shoot, so long a period of priority is unnecessary for its thriving, as it advances in strength and growth in proportion as the vine requires its sustaining power. The vine rises about two feet in the first year, and four or five more in the second; at this time, or between the second and third year of its growth, it first begins to put forth blossoms. In the rainy season which succeeds this first promise of fruit, the entwining stem is uncoiled from its support, and placed in a spiral form into a hole dug in the ground for the purpose, close to its root, leaving only the top of the plant above ground; it soon reascends the chinkariang-tree with renewed vigour, and in the ensuing season the plant, then eight or ten feet high, usually bears a full crop of fruit. If this operation be performed too soon, the vines will not be forwarder than those newly planted, and will not bear fruit until the third year. On the other hand, if delayed beyond the proper time for the sake of saving the first fruit, the produce is ultimately retarded, although the desire of a present good, in preference to a future greater advantage, sometimes incites the cultivator to adopt this plan, and to omit turning his plants down until he has gathered in a premature harvest. During three or four years after the first crop, the produce annually increases: a plantation of about seven or eight years' growth is then in its prime; it continues in this flourishing state from one to four years longer, according to the fitness of the soil, and then gradually declines for about the same period, till it is no longer worth the labour of keeping it in order. Fruit has been gathered from some plants of twenty years' growth, but that is a very uncommon circumstance. As soon as there is any appearance of decline in the crop, the plantation should be renewed, or rather another garden should have been planted to succeed it, so that it may come into full bearing at the time required. The vines sometimes grow bushy at top, when they must be pruned or thinned by hand; the flexile stems generally entwine to the top of their support, and then bend downwards, having their extremities as well as their branches loaded with fruit. In the early growth of the plant it is immaterial how many stalks grow to one root; but when it begins bearing fruit, then only one or two stems should be suffered to rise and cling to the prop; more would weaken the root, and cause it not to bear so abundantly. All suckers and side-shoots must be carefully removed. Some which are healthy and of vigorous growth are usefully employed; trenches are cut to the neighbouring props where the vines have failed, through these the superfluous shoots are conducted, and thence soon ascend round the adjacent tree; otherwise they are at once separated from the parent root, and transplanted to other spots; by which means the plantation is of uniform growth, though many original vines may not have succeeded. These shoots may likewise go to the formation of new gardens.

The ground is always kept well weeded. During June, July, and August the finer kind of grass is permitted to remain on the ground as a protection against the rays of the sun, and as the means of preserving and attracting the dews, which are then heavy. As the vines increase in size, less care is necessary in clearing the ground, since the shade prevents the weeds from growing.

Plantations are divided into gardens containing from five hundred to one thousand plants. Industrious or opulent cultivators have sometimes gardens containing as many as two or three thousand vines. These gardens are commonly separated from each other by hedges of shrubs, and have an open border of twelve feet wide round every garden. The gardens are kept with scrupulous neatness: "no rubbish, not so much as a stick or a straw, is to be found on the ground." Their symmetry and neatness give to them an appearance of beauty, although this very symmetry deprives them of the picturesque appearance admired by lovers of nature. Should the season happen to be dry, the cultivators are indefatigable in giving to their plants the necessary moisture; nearly their whole subsistence depending on the success of their crop. In very dry weather the blossoms are liable to fall untimely, or to be shaken off by high winds, in which cases the crop fails. To guard against this latter accident, the gardens are usually placed in a sheltered situation. Long continued drought arrests the progress of vegetation, but does not destroy it. We learn in Marsden's History of Sumatra, that in 1775 there were eight months of continued drought; no foliage appeared on the pepper-plants, and their general destruction was expected; but when the rain at length came, the blossoms appeared in a profusion unknown before. Old gardens which had been unprolific for one or two years, then put forth flowers and bore fruit, so that the crop of 1776-7 was unusually abundant.

The customary time for gathering the principal crop is in September and October, another smaller crop is obtained in March and April. Sometimes the gathering continues at intervals the whole year round; sometimes only one crop is taken, the growth being irregular and dependent on the season. From the first appearance of the blossoms, a period of four months elapses before the berries arrive at maturity. But the blooming is not simultaneous, and there are to be seen growing together on the same vine clusters of flowers, green fruits, and berries already in a fit state for gathering. As soon as any of the berries begin to redden, and it is thought a favourable time for collecting them, they should be plucked, for if delayed too long they fall off. The natives make use of small triangular ladders made of bamboo, with which they go round the tree and reach all the fruit, which is collected in small baskets along over the shoulders of the gatherer. It is then conveyed by women and children to a smooth level spot of clean hard ground, and there spread on mats to dry in the sun. The vicissitudes of the weather are not thought to injure it in this stage. As it dries it is occasionally rubbed with the hand to separate the stalks from the berries, which soon become black and shrivelled, and assume the well-known appearance of the black pepper of commerce. When dry, they are winnowed in large round shallow sieves, and put under shelter into vessels made of bark, until all the crop is gathered in and dried, or until there is a sufficient quantity to be carried to the factory. That gathered in the proper stage of maturity will shrivel the least; if taken off the tree too soon, it will, after being dried, quickly become mere dust.

The pepper at Borneo is classed into three different qualities. The Molucca, which is the best: the Caytongee, which is an intermediate sort; and the Negareo, which is of the worst quality, and of which the greatest quantity is obtained. This is a small hollow, light pepper, generally full of dust, and if the purchaser incautiously procures his pepper by measure instead of weight, it is said the native dealers generally contrive to substitute this for their heavy Molucca berries.

The white pepper, which is sold at an advanced price, was, for a long time, supposed to be the berries of another plant: it is now, however, pretty well ascertained that this is merely the black pepper decorticated either from accidental circumstances, or by a process to which it is subjected for the purpose. The first is called genuine, the other factitious white pepper. The manner in which the first is obtained, is thus described in Salmon's Modern History, vol. ii. p. 128.

"I do not find any traveller who pretends to have seen it (white pepper) growing. Our merchants tell us that the poor people bring it to them in small quantities, having picked it off the ground, and they apprehend that a small bird called ballaree, feeding on black pepper, digests nothing but the outward husks, and the rest having passed whole through the body of the bird, acquires whiteness. Now, if I may be allowed to give my thoughts of the matter, where the facts are uncertainly transmitted to us, I believe it may be true that this pepper is picked up by the poor people under the black pepper trees; but, as to the birds swallowing and voiding it whole, I must desire to be excused if I do not assent to it: for it seems much more probable that this is the best of the fruit which drops by itself, and by lying exposed to the weather becomes of a whitish colour, and the reason why this is so much dearer than the other is, because it is really the best fruit, and has the fire taken out of it by lying on the ground, but chiefly because there is so very little of it to be had."

The factitious white pepper is made by steeping the ripest red grains in running water, or in pits made near the banks of rivers or in stagnant pools, sometimes it is only buried in the ground. It swells in consequence of this treatment, and in little more than a week, bursts the outer husk, of which it is then divested by being dried in the sun, rubbed between the hands and winnowed. The real goodness of the pepper is, in fact, not improved by this process, the water injures its strength, while the outer husk of which it is deprived, contains more aroma than the inner part, but it is reduced to powder more readily in consequence, and presents a more uniform appearance than the ground black pepper.

The pepper-plant when in full bearing is very prolific, the bunches commonly contain as many as twenty or thirty berries in each, and sometimes one vine will yield as much as six or seven pounds of pepper; this is, however, an uncommon case, and the general average of produce in very far below this quantity. Mr. Crisp made observations on the crops obtained from the pepper gardens of Sumatra, during twelve years. At the end of that time (1777), taking the average produce of the whole number of bearing vines, he found the annual produce of 1,000 vines was 453 pounds: from other calculations, the mean annual produce of the same number of vines is given as being 404 pounds.[*]

Pepper yields a green-coloured matter by distillation, this is found by analysis to be partly resinous and partly oily, and pungent properties of the berry reside in this mixed product.[†]

PEPPER BLACK.

(*From "Materia Indica," by Whitelaw Ainslie,* M.D., M.R.A.S.)

Mellaghoo (Tam.) *Gammiris* (Cyng.) *Mirialoo* (Tel.) *Meeritch* (Hindooie). *Maricha* (Sans.) *Gol-mirch* (Hind.) *Kali mirchie* (Duk.) *Filfil Uswud* (Arab.) *Filfil seeah* (Pers.) *Lada* (Mal.) *Maricha* (Jav.) *Micha* (Bali). *Sahan* (Palembang). *Poivre* (Fr.) *Schwarzen pfeffer* (Ger.) *Pepe nero* (It.) *Pimiento* (Sp.) *Pimenta* (Port.) *Kaly meerchingay* (Mah.) *Hootseaou* (Chin.)

PIPER NIGRUM (Lin.)

Cl. and Ord. Diandria Trigynia. Nat. Ord. Piperitæ.

In no part of the world does this species of pepper grow in greater abundance than on the Malabar[‡] coast; whence it is a most lucrative export. It is, however, a production of many other Eastern countries; but in all these, Mr. Crawfurd[§] informs us, of a quality inferior to that of Malabar. The kingdom of Bantam on Java, alone, used to furnish to the Dutch,[‖] six millions of pounds annually; though Mr. Crawfurd is of opinion, that the Java pepper is the worst that grows in the Indian Archipelago. On Sumatra, three different kinds of black pepper are cultivated; the *lada lawor*, the *lada manna*, and *lada jambee*; the first or *lampoon* pepper, is reckoned the best and strongest. On *Borneo*,[¶] pepper was first cultivated by the Chinese, about fifty years ago; the produce of that island is not good. At *Palembang* there is now produced upwards of fifteen thousand peculs annually. It is a common produce of Siam, at Prince of Wales' Island; at Malacca; and at Philippine[**] islands much attention is given to the rearing of this spice.

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[*] Marsden's Sumatra.

[†] Thompson's Chemistry.

[‡] Dr. Buchanan says, in his "Travels through Mysore, Canara," &c. (vol. iii p. 269), that the best black pepper that grows in Southern India, is that of *Nagara*, sells at the rate of 515 lb. for 92 rupees.

[§] See his History of the Indian Archipelago, vol. i. p. 481

[‖] See Sketches Civil and Military of Java, p. 37.

[¶] See Dr. Leyden's Sketches of Borneo, in the seventh volume of the Transactions of the Batavian Society.

[**] See De Comyn's State of the Philippine Islands, p. 20. Pepper is there cultivated in the provinces of Tayabas and Laguna.

The piper nigrum, the *tieo-ho* of the Cochin Chinese,[*] is the *melagho-codi* of Rheede (Hort. Mal. vii. p. 23. t. 12.), is a vine requiring the support of other trees; those commonly planted for this purpose in India, are the *betel nut* palm (arecha catechu), the *moochie wood tree* (erythrina Indica, Willd.), the *mango tree* (mangifera Indica), the *jack tree* (artocarpus integrifolia), and the hyperanthera moringa; but it has been remarked, that the vines which cling round the two last thrive best. The trees commonly preferred in the islands of the Eastern Archipelago, are what the Malays call the *dapap* (erythrina corallodendron), and the *manghudu* (morinda citrifolia). The plants are about four years old before they produce fruit, and the berries are nearly five months in coming to perfection, from the time they first appear. The plant is the *Filfil* of Serapio (c. 367.). The Arabs consider pepper as powerfully deobstruent, and as such, I see it has a place amongst their *Mufettchat*. With regard to the notions of the ancients respecting pepper, the reader may consult Pliny and Celsus; the first (lib. xii. cap. vii.) tells us where it was produced best in his day, and enumerates three sorts; the second mentions both the round and long pepper amongst his diuretics[†] (lib. ii. cap. xxxi.). Nine species of *piper* are growing in the botanical garden of Calcutta; eight species grow in Ceylon.

As a medicine, the native doctors of India consider black pepper as stimulant and stomachic, and prescribe an infusion of the toasted berries in cases of cholera morbus; and I have myself known it put a stop to the vomiting in this disease,[‡] when many other remedies had failed. They also prepare with it a kind of liniment, which they suppose to have sovereign virtues in chronic rheumatism. In Europe it is occasionally employed as a stimulant in retrocedent gout, and in palsy. The watery infusion has proved a useful gargle in relaxation of the uvula. The dose of the black pepper may be from six grains to a scruple. What is commonly called *white pepper*, is merely the black pepper blanched by steeping it for a time in water, and afterwards gently rubbing it so as to remove the dark outer coat; it is considerably milder than the other, and is much prized by the Chinese; a great deal of it is prepared at Bencoolen. It appears from Avicenna (Can. lib. ii. tract ii.), that in his day the white pepper was most esteemed as a stomachic; and Celsus says, that it was one of the ingredients used in preparing a famous antidote (lib. v. cap. xxiii.). The use of ablck pepper as a seasoner of food, will be noticed in another part of this work, suffice it here to observe, that it is a never-failing ingredient in many of the Indian dishes, *curries*, *mellaghotanie*, *pilloes*, &c., as well on account of its pleasant flavour, as from a conviction of its powerful stomachic* virtues; it is, doubtless, the most valuable of all the spice kind. Before concluding, I shall shortly state that the piper nigrum "is a climbing plant; the *leaves*, which are ovate, entire, pointed, seven-nerved, and dark-green, are petiolate at the joints of the branches; the *flowers* are sessile, white, small, and placed on terminal spikes, without any regular calyx or corolla; the fruit is a globular berry of a red-brown colour."

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[*] Loureiro speaks highly and justly of the virtues of black pepper, extending its tonic virtues to the brain as well as the stomach. Vide Flora Cochin-China, vol. i. p. 30.

[†] The same virtue in pepper is noticed by Rhazes. Vide Opera Aphorismorum, lib. iii. p. 536.

[‡] Though a far more certain mode of combating that disease, in its sporadic form is by a speedy use of calcined magnesia, given not in milk, but in tepid water.

The piper peltatum, Dr. Horsfield informs us, is common at Java, there called *lamba-ang gelumbo*. The fruit is applied externally, in swellings and dropsies, in many of the Eastern islands. Mr. Brande regrets that the piper nigrum has not been satisfactorily analyzed; it contains, he adds a volatile oil, with starch and extractive matter.

PEPPER, CAYENNE, OR CHILIE.

(*From "Materia Indica," by Whitelaw Ainslie*, M.D., M.R.A.S)

Mollaghai (Tam.) *Merapakaia* (Tel.) *Brahn maricha* (Sans.) *Lal mirchie* (Hind.) *Fulfili surkh* (Pers.) *Felfel-achmar* (Arab.) *Meneshena* (Can.) *Lombok* (jav.) *Lada mira* (Mal.) *Tabia* (Bali.) *Poivre d'Inde* (Fr.) *Spanischer oderkercher pfiffer* (Ger.) *Pepperone* (It.) *Gasmiris* (Cyng.) *Tambhudda meerchingay* (Mah.)

CAPSICUM FRUTESCENS (Lin.)

Cl. and Ord. Pentandria Monogynia Nat. Ord. Luridæ.

Our present article, which is universally called red or Cayenne pepper or Chilie by the English in India, is not the produce of the capsicum annum, but of the capsicum frutescens (Lin.) which is the capsicum Indicum of Rumphius (Amb. 5. d. 248. t. 8.); it is usually termed the *shrubby capsicum* plant by botanists and is the *capo-molago* of Rheede, in contradistinction to the capsicum annum which he calls the *Vallia-capo-molago*. The difference betwixt the two does not appear to be considerable, and would seem chiefly to consist in the nature of the stem, which in our article is shrubby; while in the other it is herbaceous. The Chilie plant is the *lat-tsiao* of the Cochin-Chinese, who use much of the fruit with their victuals (Flor. Cochin-Chin. vol. i. p. 128.). It is cultivated in every part of India, on account of the pod, or rather pod-like berry, so much used by the natives as a warm seasoner. As a medicine, the *Vytians* believe it, and justly, to be stomachic and stimulant; and also prepare with it cataplasms, which they employ in cases requiring rubefacients. It has of late years been successfully given in England in atonic gout, dyspepsia, accompanied with much flatulence, tympanitis and palsy. Dr. Wright has recommended capsicum in dropsies, and other cachectic complaints, when chalybeates are at the same time indicated:- dose from gr. vi. to gr. x. in pills; of the tincture, from ʒi. to ʒij. in a glass of water. As a gargle it is supposed to clean, without impeding the healing of ulcers in the fauces; this gargle, Dr. Thomson says, is prepared by beating into a paste ʒi of the cayenne pepper, and ℈i. of common salt, then adding ℥vi. of boiling water, and to the solution, when cold, ℥v. of vinegar. With hogs' lard, capsicum forms a good liniment for paralytic limbs.

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* A virtue Roques is quite sensible of: in his Phytographie Medicale he says, in speaking of it, "il corrige par sa qualite stimulante les alimens, fades ou visqueux, reveille les facultes digestives; et donne aux temperamens inertes unsentiment de force et d'alacrite."

There are growing in the botanical garden of Calcutta, six species of capsicum; the annuum, grossum, frutescens,* baccatum, purpureum, and minimum. The grossum is called in Hindoostanie *kaffrie-murich*. Of our article, the frutescens, there are two varieties, the red and yellow, termed in Bengalese *lall-lunka murich* and *huldi lunka murich*; the two last species have been scientifically examined by Dr. Roxburgh; of these the minimum is named in Hindoostanie *dhan-murich*. The c. grossum bears a fruit as large as a small apple, which is called by the English India *Coffrie Chillie*; it is preferred for pickling, the skin being fleshy and tender: the seeds are previously taken out. Virey,† in his "Histoire Naturelle des Medicamens," expresses a singular notion, that it is owing to an abuse of this pickle that the inhabitants of hot climates suffer so much from liver complaints.

The Chillie plant is constantly found in its wild state in the Eastern Islands,‡ though, from its being so commonly called Chillie, Rumphius argues its American origin. "It seldom rises higher than four feet, with a roughish stem, and branches diffused, and often scandent; the *leaves* are lanceolate, quite entire, waved, small, smooth, petioled, alternate or scattered; *flowers* axillary, small, white, and five or six-cleft."

Capsicum is supposed by the German physicians to be peculiarly injurious in gonorrhæ, "imo gestatuen in linteo supra abdomen, gonorrhæum post octo menses resuscitavit" (Murray's Appar. Med. vol. i. p. 704.)

PEPPER, LONG.

(*From "Materia Indica," by Whitelaw Ainslie*, M.D., M.R.A.S.)

Tipilie (Tam. and Cyng.) *Pipuloo* (Tel.) *Pipilie* (Duk.) *Pipel* (Hind.). *Pippali* also *Krishna* (Sans.) *Dar filfil* (Arab.)

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* Mr. Moon, in his valuable Catalogue of Ceylon Plants, informs us, that the Cyngalese name of the capsicum frutescens is *gas miris*, and that there are three varieties of the plant in that island; a red, a yellow, and a black. See work, p. 16.

† See the work, p. 182.

‡ See Crawfurd's Eastern Archipelago, vol. i. p. 377.

Filfili daraz (Pers.) *Tabee* (Mal.) *Chabi-jawa* (Jav.) *Poivre longue* (Fr.) *Langer Pfeffer* (Ger.) *Pepe lungo* (It.) *Pimienta larga* (Span.)

PIPER LONGUM (Lin.)

Cl. and Ord. Diandria Trigynia. Nat. Ord. Piperitæ.

This species of pepper, which is the *Cay-lot* of the Cochin-Chinese,[*] is produced in abundance in many parts of Upper as well as Lower Hindoostan. The berries are small, and lodged in a pulpy matter, like those of the black pepper; they are at first green, and become red when ripe. Having been found to be hottest in their immature state, they are then gathered and dried in the sun, when they change to a dark grey colour. It is imported in the entire[†] spikes, which are about an inch and a half long, and indented on the surface.

Dr. Cullen is right when he says this pepper has the same qualities as the black, but in a weaker degree; the aromatic odour is rather faint, but its taste is pungent. The *Vytians* on the Coromandel coast prescribe it in infusion, mixed with a little honey, in catarrhal affections, when the chest is loaded with phlegm; the plant is the *cattu-tirpali* of the Hort. Mal. (vii. p. 27. t. 14.) It is a perennial, a native of India, and also Nepaul[‡] and Java[§]; "its *stem* is smooth, branched, slender, and scandent; *leaves* cordate, pointed, nerved, and of a deep green colour; the *flowers* are small, in short, dense, terminal spikes, nearly cylindrical."[¶]

There is a large variety of it sometimes met with in Lower India, called in Tamool *ana tipilie* (or elephant pepper). in Telinghoo it is *yeanigha pipullo*, and in Sanscrit *gaja kunnie.*

The *root* of the long pepper is a favorite medicine of the Hindoos; it possesses the virtues of the berry, but in a weaker degree; and is prescribed by them in cases of palsy, tetanus, and apoplexy. It is termed in Sanscrit *granthika* and *pippali-mula*; in Tamool by the various names of *bengala modie*, *kandam-tipili*, and *tipili moolum;* in Hindoostanee it is *peeplamool;* in Persian *beik deruckt filfil draz;* and in Arabic *filfil mooeh*. The Arabians consider it as cardiac.

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[*] Loureiro speaks highly of the medicinal virtues of long pepper: "calefaciens, stimulans, deobstruens" (Vide Flora Cochin-China, vol. i. p. 32.)

[†] See the London Dispensatory.

[‡] See Kirkpatrick's Account of Nepaul, p. 205.

[§] An export from that island to Surat. See sketches Civil and Military of Java, p. 207.

[¶] The Arabians, in the days of Avicenna, thought very highly of this medicine; he said of it, "concoquit digeritque cibum, et ventriculum roborat: libidinem concitat, zingiberis æquat efficacitatem." Canon. Med. lib. ii. tract ii. p. 106.

PEPPER.

(From the "Treasury of Botany," by John Lindley and Thomas Moore.)

PIPER.—This name was employed by the Romans to designate the Pepper-plants, and was derived by them from the Greek word *peperi*. The Greeks, in their turn, must have derived it from the Hindoos. Botanically, it is applied to the typical genus of *Piperaceæ*, the species of which are for the most part climbing shrubs, with alternate stalked leaves; stipules adherent to the leafstalk or opposite and deciduous; spikes solitary stalked, pendulous, opposite the leaves, with diœcious or perfect flowers, protected by oblong decurrent bracts. The species are indigenous in India, the islands of the Indian Ocean, the Sandwich Islands, &c., and some of them are abundantly cultivated in the tropical countries of the New as well as of the Old World.

P. nigrum yields the Pepper of commerce, a condiment that has been held in high esteem from the earliest times. It is frequently mentioned by Roman writers of the Augustan age, and it is related that in the fifth century Attila demanded, among other things, 3,000 lbs. of pepper in ransom for the city of Rome. Pepper is cultivated in the East and West Indies, Sumatra, Java, &c., but that which comes from Malabar is held in the highest esteem. The Pepper-vine will, if left to itself, attain a height of twenty or more feet, but in cultivation it is found more convenient not to allow it to exceed the height of twelve feet. The plants are placed at the base of trees that have rough or prickly bark, in order that they may the more readily attach themselves to the trunk. In three years they produce their spikes of fruits, and continue to do so for some seven or eight years, after which time they become less productive. The fruit when ripe is of a red colour; it is gathered before it is fully ripe, and spread on mats in the sun, when it loses its red colour and becomes black and shrivelled, as we see it in the peppercorns of the shops: this is black Pepper. White Pepper is the same fruit, freed from its outer skin by maceration in water and subsequent rubbing; occasionally it is rendered of a yet paler colour by being submitted to the action of chlorine.

Sir John Mandeville, who travelled in the years 1322 to 1356, has given us an account of the Pepper, which, with some exceptions, applies as well now as then. 'The Pepper growethe,' he writes, 'in manner as doth a wylde vine, that is planted fast by the trees of the wodee for to susteynen it by, as doth vyne, and the fruyt thereof hangethe in manere as Reysinges; and the tree is so thikke charged, that it semethe that it wolde breke: and when it is ripe it is all grene, as it were ivy berryes; and then men kytten hem as men doe the vynes and than thei putten it upon an owven, and there it waxeth blak and crisp.'

Pepper is imported into this country in enormous quantities, and is used as a condiment. Medicinally it is employed as an acrid **stimulant** in cases of weak digestion, and it has also been recommended in cases of ague to ward off the paroxysm, a practice recommended by Celsus. Pepper is also sometimes employed externally. Pepper on chemical analysis is found to contain a hot acrid resin, and a volatile oil, as well as a tasteless crystalline substance called *piperin*, which has been recommended as a substitute for quinine. This piperin is especially contained in some large coloured cells in the interior of the fruit. Ground Pepper is frequently adulterated, according to Dr. Hassall, with linseed, mustard-seed, wheat-flour, pea-flour, and ground rice; sago has also been mentioned as being employed for this purpose. All such admixtures can be readily defected by the microscope. At one time, when a very heavy duty was levied on this substance, factitious peppercorns were manufactured of oilcake, clay, and a small portion of cayenne. Pepper-dust, known in the trade as P. D. or H. P. D. (hot pepper-dust), consists of the sweepings of the floors of the warehouses wherein pepper is stored, or of the siftings of the pepper. It is used to mix with genuine ground pepper, also for pickling. The root of the Pepper-plant is employed by the natives of India as a tonic stimulant and cordial.

P. trioicum, a nearly allied species to *P. nigrum*, yields also some little of the Pepper of commerce. Dr. Roxburgh, who first cultivated this plant, observed that the pepper of the female vines did not ripen properly, but dropped when green, and was deficient in pungency; but the pepper of those plants which had hermaphrodite and female flowers mixed on the same spike was very pungent, and reckoned by the merchants as equal to the best Malabar Pepper.

Long pepper is the produce of *Chavica Roxburghii*. The Betel Pepper-leaf is also the produce of another species of *Chavica*, *C. Betle*; while Cubebs, another fruit formerly referred, like the two last-mentioned, to the genus *Piper*, is now considered to form a distinct genus, *Cubeba*. [M. T. M.]

PEPPER FROM THE WEST COAST OF INDIA.

Pepper, it seems, is all native grown, but it is possible that the culture may pay the few Europeans in Ceylon who have taken it up, in view of the fact that warfare in Achin seems to have revived and is likely to be indefinitely protracted. The possession of the chief pepper grounds in the world have cost and are likely to cost our Dutch neighbours more lives and money than they are worth. But prestige has also to be sustained. Curiously enough, the transaction between the British and Dutch Governments, by which, in exchange for a small Dutch colony in Western Africa, we gave up the grand island of Sumatra entirely to the Dutch, involved both nations in little wars. Ours against Ashantee was speedily concluded by the man who is now the hero of Egypt. General after General, on the contrary, has returned with a shattered reputation from the war in "Atjeh," as the Dutch call Achin. Governor Loudon sent too small a force to begin with and an officer, whom he censured for not doing what the officer pleaded was impossible, got himself removed from the Army "with honour," for the insubordination of refusing to take the hand which the Governor-General extended to him on landing at Batavia. He gave a formal military salute instead and got shelved. Such are the consequences due to pepper and the mental idiosyncracy to which the spice gives the name of "peppery !"

PEPPER; CUBEBS, &c.

(*From "Ferguson's Ceylon Handbook and Directory for 1900-01."*)

In 1650, it was reported that the "Pepper grown in Ceylon was sold at a higher price than that produced elsewhere." Governor van Imhoff, in 1740, considered pepper "a far more important article" than cardamoms, and he added that "unlike coffee (!) it is not probable that the demand will be lessened by a change of opinion as to its salubrity, or by its being overgrown in other places, as all grounds are not able to produce it." In 1739, the Dutch exported 465,000 lbs. of pepper, the greater portion from the Kandyan provinces, where the harvest began in December and ended in April. Bertolacci blames the indolence of the natives for not greatly extending the cultivation of the peper vine, which will grow on almost any soil, and has everywhere forest-trees to spread over. The fruit itself, when gathered, requires no further care than having it well dried. In 1813, the export of pepper was 190⅔ candies, valued at about £12,000, and the average for seven years was then 200 candies, or about 1,000 cwt. The site of the former Dutch pepper gardens at Madampe has long been under coconuts. Bennett, in 1843, declared that the District of Kalutara alone ought to produce more pepper than the whole of the island did.

The late Dr. Thwaites in his annual reports frequently called attention to the advantage of cultivating the black pepper vine; and its cultivation of recent years has been extending in the planting districts round Kandy, Panwila, Galagedara, Kegalla, Balangoda, etc. Dr. Trimen in his Report for 1882 had the following paragraph :—

"*Pepper.*—As the cultivation of this condiment is attracting some attention in the Southern Province, I have been at the pains to obtain from Singapore some roots of the best sort there grown. These only arrived towards the end of the year. They are growing vigorously, and will be cultivated in the Singapore manner. *Erythrina* stumps have been planted for the support of the 'vines.' The foliage of these plants appears at present to show considerable differences from any of the peppers grown by the natives here."

The *Erythrina* stumps were, we believe, eaten up by white-ants. In his report for 1887, Dr. Trimen says :—

" *Pepper* (*Piper nigrum*).—The plants received from Singapore two years ago are now making good growth, and appear to be of a more vigorous and better variety than any of the native ones so much grown for local sale. It is remarkable that the cultivation of this product on a large scale for export has never been seriously taken up in Ceylon."

In his Report for 1888 we read :—

" As regards *Pepper*, I am glad to see signs of its being taken up on a larger scale. We have disposed of considerable quantities of both cuttings and seeds of the good native variety grown at Henaratgoda, and it is satisfactory to learn that a consignment of this sort grown on an estate near Kandy, so high as 2,000 ft., has sold in London at an excellent price. This cultivation is also, of course, eminently suited to the native villager, by whom indeed it has long been practised on a small scale. Good accounts of the modes of cultivation followed in Johore, and in Malabar, respectively, will be found in the *Tropical Agriculturist* for September and November, 1888 (pp. 154 and 354); the latter being probably the most suited to the conditions prevailing here."

Nearly all the pepper so far produced in Ceylon has been consumed locally and for many years back the only export return have been a few bags; thus in 1880 we had 118 lb. worth R30; 1887 gave 1,578 lb. worth R318; 1889, 14,810 lb. value R3,427; 1890, 584 lb. value R331; 1891 = 1,830 lb., R733; 1892 = 10,027 lb., R2,696; 1893 = 101 cwt., R1,392; 1894 = 143 cwt., R3,515; 1895 = 237½ cwt.; 1896 = 375; 1897 = 19 cwt.; 1898 = 42 cwt.; 1899 = 759 cwt. and 34 bags; 1900 = 519 cwt. Strangely enough, in 1900 we imported 1,397 cwt., value R40,567, whole pepper from Straits and India paying R1½ per lb. customs duty; and 222 cwt. long pepper from India value R4,845 paying R3 a lb. duty. Our returns show about 300 acres under the pepper vine in the planting districts; but there must in reality be a good deal more, especially in Matale, Kegalla and lowcountry districts. Experiments made at Udugama by Mr. Dobree did not turn out very well, owing to white-ants eating up the artificial supports given to the vines; where, however, the natural forest trees were left and utilized, the cultivation did better. In the Straits they prefer cultivating in the open, using teak posts (which defy the white-ants) as supports. There cannot be the least doubt that a great deal more than at present might be done in Ceylon with pepper by both native and European planters, and it is one of the few tropical products for which the demand continues fairly good.

Pepper is grown in Java for the Dutch Government under the same system as coffee; the creeper is cultivated in rows trained over trellis-work or posts not unlike the vine in France. Rows of pepper creepers and coffee trees frequently alternate. The culture is being begun in North Borneo. In Burmah 225 vines on trees to the acre after

4 years, yield 1 lb. pepper per tree. **Jamaica pepper, pimento** or "all-spice" is exported up to 100,000 **cwt. a year, valued** at about £100,000.

The world's production of pepper may be put down at 100 millions of lb.: Java 15; Sumatra (including Acheen) 29; Malacca, Penang, &c., 10; Borneo 4; Siam 5; **Jamaica**, 10; and India and Ceylon 25 millions. Travancore exports nearly R500,000 worth or 1,200 candies annually, some of it to Ceylon. The total export of pepper from India in 1888-9 was 7,666,007 lb. valued at R3,168,324. In season 1892-3, the export was over 12¼ million lb.; but in 1894-5 it fell to 8½ million lb. In 1895-6 nearly 10: 1896-7 over 13½; 1897-8 over 9½ million lb.; 1898-9 about 10 million lb.; 1899-1900 say 8½ million lb., and 1900-1 down to 7 million lb. For year ending 30th June 1900, the Tellicherry Export table shews 168,001 cwt. nearly 19 million lb. for Southern India alone due perhaps chiefly to Travancore.—The extraordinary fact is that Ceylon should import in 1900 no less than 1,619 cwt. of pepper (value R45,412) from India and Straits.

From Dr. Trimen's latest Report (1887) we quote, with reference to an allied culture:—

"*Cubebs.*—The high price at which this drug has been lately selling in the home market has led to several inquiries as to the possibility of its cultivation in Ceylon and the means to obtain plants. A few remarks may be therefore offered on the subject.

"*Piper Cubeba* is a pepper, and, like the majority of its congeners, is a climbing plant. It is considered to be native in Java, Sumatra, and Borneo, but can scarcely be said to be known wild. The cultivation of Cubebs as a commercial pursuit appears to be carried on only in certain parts of Java and Sumatra, and the business to be almost entirely in the hands of the natives. The dried fruits, which form the Cubebs of commerce, come into trade through Singapore. No details are known of the mode of cultivation, which, however, appears to be merely that of ordinary pepper, the stems being allowed to climb over the trunks of trees, and the fruits plucked before they are quite ripe, and carefully dried. There is no reason to doubt that it could be easily carried on in the moist low-country of Ceylon, and it is perhaps remarkable that it has not been practised by our native population who grow other kinds of pepper so largely. It is, however, by no means easy to obtain the true *P. Cubeba*, which is a plant very little known, and indeed imperfectly understood even by botanists. Several other species approach it very closely, and even at Kew the cultivated plant, hitherto believed to be *P. Cubeba*, and figured by me under that name in 1877 ('Medicinal Plants' III., to 243), has since been determined to be another species; and there is nothing now there to represent the Cubebs plant.* The botany of the subject is still greatly involved, and in trade also numerous spurious and false Cubebs are met with, the fruits of allied species.

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* See Kew Bulletin for December 1887, where will be found a figure, taken from a dried specimen from Java, of the true plant. A more complete illustration is given in two folio plates in Miquel's treatise "De Vera Pipere Cubeba" (1839), of which there is a copy in the Peradeniya Library.

"One of the difficulties in the way of commencing the cultivation of Cubebs is due to the plant being diœcious, with the male and female flowers borne on different plants. On several occasions I have succeeded in getting plants for the Gardens, and at present I have some fifteen young plants at Heneratgoda, obtained by propagating from a single one from Singapore. Unhappily, on flowering, this proved to be a male, as has been the case with each of the other plants I have been able at different times to obtain. Either sex is, of course, useless alone, and I am now attempting to get ripe seed from Java. But it appears to be difficult to obtain this from the natives. The crop is said to be a somewhat uncertain one, and this may account for the irregular supply of the market and the great fluctuations in price.

"Cubeb plants got in a wardian case from Java through the late Mr. Cantlay of the Singapore Gardens are now being carefully cultivated by a Matale planter."

For 1888, Dr. Trimen's report was :—

"*Cubebs.*—In continuation of my notes on this subject, I regret to say that all my efforts to introduce this species into Ceylon still remain unsuccessful. . . . This has become more than ever an object with me, as I find, on the flowering of a female example of Henaratgoda, that the plant from Singapore alluded to in my last report is, like that from Kew, not the true *P. Cubeba*, but merely *P. Chaba* (*P. officinarum*), a species with short, dense, cylindrical spikes of fruit like long pepper (*P. longum*). As far as foliage goes, *P. Chaba* seems indistinguishable from *P. Cubeba*, and to be constantly mistaken for it. I doubt whether there exists at the present time a single plant of the true Cubebs outside of the Dutch East Indies. We have now at Henaratgoda some 60 plants of *P. Chaba* (Singapore and formerly, Kew '*P. Cubeba*') growing luxuriantly, but I am not aware that the fruit has any particular economic value, though it is known to afford a long pepper in Java."

In his Report for 1891, Dr. Trimen states :—

"CUBEBS :—As one result of my expedition to Buitenzorg, I have at last succeeded in obtaining the true *Piper Cubeba*, which for so many years I have been vainly trying to get. Thirty-one rooted cuttings were obtained from the Java Garden, and twenty reached Ceylon in apparently good health. Most of these have however since died, and at the end of the year only eight were living. I have, however, little doubt that these will succeed at Henaratgoda, if not at Peradeniya. At Buitenzorg I found the plant grown on white cotton trees (*Eriodendron*) closely planted; they were fruiting freely. The difference in the form of the upper and lower leaves on the same plant was striking; they would never be supposed to belong to the same species. I am not, however, sure that there are not two plants cultivated together as *P. Cubeba* at Buitenzorg.* I had no opportunity of seeing the cultivation of this product on a commercial scale, and it does not seem to be carried on in W. Java. The plant, however, is apparently a wild one there, to judge from the labels of plants I examined in the Buitenzorg herbarium. All the specimens of the true plant have the leaves (however much differing in form according to age) thick, with an unequal base, alike on both surfaces, and drying of a pale colour with a pinkish tinge; the younger ones are more veiny beneath. I may refer to my reports for 1887, 1888 and 1889 for further remarks on this pepper. A small plantation of 36 seedlings, raised from Jamaica seed, was made at Peradeniya in April; a smaller one was also made at Henaratgoda. We have not as yet found this tree to do well with us, and it is equally unsatisfactory in Java. Our trees at Henaratgoda, eight years old, have as yet made no attempt to flower."

In his Report for 1892, Dr. Trimen reports that three of the Java plants were planted out at Henaratgoda and two at Peradeniya against *Erythrina* trees in March, but they make scarcely any growth. Two produced flowers, but unfortunately the plants proved to be male. No better success attended further experiments at the gardens with plants and seed in 1893 and 1894. In his last Report (1895), Dr. Trimen speaks of one cubeb plant being killed by drought; but of the other as being established in growth.

NOTES ON PEPPER CULTIVATION.

(*By an Old Planter in the "Ceylon Observer."*)

Seven or eight years ago I discovered that branches of the pepper vine, sometimes under favourable conditions, struck root and became plants; but that such plants never threw out running vines was an after discovery. Still it did not strike me, that this could be turned to account in cultivation, till about a year ago, when one of those branch plants came into bearing, and produced a very decent crop. It then occurred to me that to cultivate the plant in the form of a low bush, would be more convenient than any of the methods in common use. In growing the plant on living trees you can only put a plant where there is a tree, at irregular distances, not more than about 100 to the acre, fighting with the old established tree that supports it for a share of the plant food, and suffering from too much shade. Again if posts be set up for the vine to run on, they are in the first place expensive, and in the second the most durable only last for a few years, when the whole affair tumbles down, and is not easily set up again. The branch plants can be put out at regular distances, say 6×6 feet, they can be easily cultivated and manured, can be pruned back as required, and the only other work needed is a few pegs and a piece of coir yarn to keep the branches from trailing on the ground. The chief difficulty is at the beginning to get the branch to strike root, but that can no doubt be overcome by proper arrangements to be taught by experience, even the vine is by no means a ready rooter.

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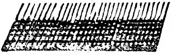
* I saw nothing at Buitenzorg quite corresponding with the plant we received as Cubebs from Soerabaya in 1889 (see my Report for that year) though some specimens approached it nearly. I suspect that this will prove to be *Piper (Cubeba) sumatranum* (figured in Miquel's Comm. Phyt. t. 5), which is perhaps really a variety of *P. Cubeba*. But till it flowers and fruits this must remain doubtful.

That pepper requires shade is a common error; I have found it much more fruitful in the open than in the shade, but in or out of shade its cultivation will only be satisfactory on tolerably good soil. I understand that many of both natives and Europeans are trying this plant. It is one of the things that will pay, and pay well under proper conditions of soil, climate, and cultivation, and I wish them all success.

[A modification of the bush system might be tried after the viticulture which we saw in the neighbourhood of Stutgardt. One or two branches only of a vine were allowed to grow, and all the strength of the plant went into these. When the branches had attained the length desired and the proper season had arrived, they were curled round so as to resemble a hoop and then tied so as to compel them to retain this position. Those who understand the physiological laws of plants will understand how the branches, with the flow of their juices thus checked, put forth blossom and fruit at every pore. What gave the maximum of fruit in the case of grape vines might be equally successful in the case of pepper vines.—COMPILERS.]

Another practical planter reporting for a small clearing writes :—

PEPPER.—It was, I believe, decided to plant the remaining forest land, about 12 acres, with this product; all the undergrowth and small trees should be cut down so as to admit abundance of light, at the same time affording a moderate degree of shade. Trees to support from 250 to 300 vines to the acre should be retained. The stuff cut should, before becoming too dry, be piled in small heaps and burnt, care being taken to do as little harm as possible to the standing trees. This work can be done in January and February, and in the meantime a space of about one acre should *at once* be cleared in the above way, the ground dug about a mammotie deep and all small and fibrous roots removed: stumps need not be touched. In this space pepper cuttings should be laid down about an inch apart—12 inches buried under the soil and six inches exposed thus :—



The cuttings should be about 18 inches long and the branches cut from off the portions to be buried, but not from the portions exposed; for the 12 acres about 15,000 cuttings will be necessary. By May next year these should all have made roots and shoots, and be less liable to fail when planted out than if put out as simple cuttings; another consideration is that there will be no time lost in searching for vines, which might be the case where so many are required. After the undergrowth has been cut down and burnt, holes should be dug at the root of each tree *close up to the stem*; one on each side, if the tree is large in girth, but only one if small. The holes should be 18 inches long, 12 inches broad and 9 to 10 inches deep, all stones and roots removed and filled in with surface soil, any ashes, near being mixed with it. In planting out all that portion that was underground in the nursery should be buried and the exposed portion laid close up to the stem of the tree; two cuttings should be placed in each hole, a few inches apart and about 4 inches deep and the earth firmly trodden down. If these directions are carefully attended to failures will be few. I cannot too strongly urge the necessity for trampling down all the soil round plants freshly planted and of beating down the soil over seeds as soon as sown; it is not necessary here to give the scientific reason for this; let it suffice that experience teaches that when this is not done many plants are sacrificed and much seed wasted.

PEPPER CULTIVATION IN JOHORE.

(From an Old Resident.)

Black pepper is grown in Johore by the Chinese gambier planters who utilise the spent gambier leaves to manure the pepper vines. Some Europeans are planting pepper in Johore. The high price now obtainable for this article has induced Chinese and Europeans in British North Borneo. Malacca, Perak. Selangor, Sungei Ujong, and on the island of Singapore to plant extensively. A few years ago it could be bought for $7 per picul (133⅓ lb.), today it fetches $20 85-100ths per picul. It flourishes in Johore, both soil and climate seems to suit the plant excellently. In the year 1886, 98,074 piculs valued at $1,829,220 of black pepper was sent to Singapore from Johore and 313 piculs valued at $3,630 was also sent to that port. This value must be a mistake because the manufactured white pepper fetches nearly as much again as the natural black. At present it is $36 per picul. Above statistics are taken from the Straits Settlements Blue Book for 1886. Singapore Exchange Market Report states that in 1883, 89,936 piculs black and 25,955 piculs white were exported from that port and in the year 1888, 72,864 piculs of black and 19,172 piculs white were exported. As long as the war between the Dutch and the Atchinese lasts prices of pepper will keep up.—March 1889.

PRODUCTS OF THE STRAITS SETTLEMENTS.

Pepper Cultivation.—Black and white pepper grow on the same wine; the green pepper-berries, just before maturity, after gathering, turn black and make "black pepper," while "white pepper" is obtained by gathering the berries—fire-red in colour—when fully ripe, and through long soaking in water and subsequent stirring, and shaking, relieving the berries of the other skin; after which, on being dried, they become "white." In what country the pepper-vine originated, the writer is unable to say; but Eastern history says that the northern half of Sumatra, the once mighty old sultanate of Acheen, when the Portuguese, Dutch and British (in rotation) came to that country, was far famed for that spice, which drew, at Acheen Busar, in North Sumatra (near the entrance of the Straits of Malacca), the native traders from many Eastern countries and islands who there exchanged the products of their countries or purchased for cash. After the British East India Company, during the last century, acquired the island of Penang from the Rajah of Quedah, a Siamese souzerain, so favourably situated for commercial purposes, and made it a very important factory and place of residence for a sub-governor, the great Acheen trade gradually drifted to Pulo-Penang (Prince of Wales Islands), and with it the pepper trade principally. At the time Singapore had not been acquired by the British, and not before 1819, when the island was covered with a dense trackless jungle. After the acquisition of Penang the natives on the peninsula of Malacca, especially in the province of Frang, a Siamese souzerain province, commenced to plant pepper, and with excellent success; and now it is extensively planted by Malays and Chinese in many places on the peninsula of Malacca, also in Siam, Cochin-China, and in Sarawak, Borneo. That grown in the southern part of the peninsula and on the island of Singapore, known in the market as "Singapore pepper," is by far the best, commanding a higher price than Acheen pepper. Penang maintained the Acheen pepper trade until the Dutch commenced their war of conquest in Acheen in 1873, blockading the coast and preventing the exports of all Acheenese of products. At that time, owing to the spread of wild rumours about the destruction of the pepper gardens in Acheen etc., pepper reached the figure of 14 dollars per cwt. for a short time. It was feared the supplies from Acheen being cut off, that the spice would become scarce, and as a consequence many Chinese planters increased its cultivation: in fact, to such extent that the Acheen war was no longer looked upon as the cause of influence in prices. Later some of the chiefs of certain Acheenese provinces having submitted to Dutch rule, were allowed to send pepper to Penang on vessels having a permit from the Dutch Consul in Penang to supply them with rice and other needed goods. Then it appeared that some of the Rajahs who had submitted to the Dutch, after having been pretty well supplied with the necessaries of life, turned truant again, and, as a consequence, their coasts were again blockaded. The Dutch are now making efforts to make "Ole-Seh," the old port of Acheen Busar, in fact well protected by a fort and man-of-war, a trading port, and to export "Acheen pepper from Acheen" themselves. As to the pepper-vine it presents a very handsome appearance; a pepper garden at a distance looks like a "hop-yard." Some planters, however, trellis the vine, and the writer thinks that is the best plan. It grows everywhere round about Singapore very easily and luxuriantly on fair upland soil, not liking low heavy soil, and, like the grape-vine, needs occasional pruning, weeding and fertilizing. With a little care and attention it yields abundantly and proves a good source of income. The quantity of pepper exported annually from the Malay peninsula and parts in Dutch India is simply immense, and is almost extensively planted, gathered, and brought to market by natives, Malays and Chinamen chiefly.—*Weekly Drug News*,

THE PEPPER VINE.

(To the Editor "Ceylon Observer.")

DEAR SIR,—As I find natives about here are taking a lot of pepper vine cuttings for sale to planters, I desire to warn planters to be careful from what vines they purchase cuttings, as there are three distinct species, of which there is only one good. The fruit of all, as far as appearance goes, is nearly alike, but the taste differs and there is a great difference in leaf-stock.

1st. Gammeeris in Colombo Sinhalese or Lanutie Midde in Kandyan Sinhalese is the only good kind.

2nd. Mally Middee comes next; fruit is bitter.

3rd. Bakka Moona, a thick strong creeper, leaves thin. There is also Kottang Kolly, a pepper *shrub*. I now send you by this train a cutting of each kind with fruit on and leave you to give a full description of each species. When planters purchase pepper cuttings they should either purchase from some one they can depend on or send a trustworthy man who knows the proper kind to see the vine before the cuttings are taken. Natives cultivate the bad kinds, as they take the leaves for medicine and sell the fruit to traders who purchase the same for mixing.—Yours truly,

J. HOLLOWAY.

THE PEPPER-GROWING INDUSTRY OF WESTERN INDIA: INFORMATION DESIRED.

Colombo, 23rd January 1883.

DEAR SIR,—If you, or any of your correspondents can give information respecting the cultivation of pepper, as pursued in the Calicut and Tellicherry districts of Southern India, you would, by publishing the same in the *Observer*, oblige some of your readers. Answer to these questions would be useful :—

1.—Is shade employed?

2.—If it is, is the shade light or heavy, and what are the most suitable shade trees?

3.—If shade is not employed, to what are the vines trained, and how far apart are the supports? (Mem: In Singapore and Johore pepper is not shaded, but trained to posts of wood stuck into cleared ground.)

4.—How high are the vines allowed to grow?

5.—How many cuttings or plants are placed at each support?

6.—How long after being planted do the vines take to bear.

7.—What is a fair average yield per acre?

8.—How is the fruit dried or cured?

9.—What are the most suitable soils?

10.—Is a climate with 150 inches of rainfall, well distributed, too wet ?—Yours faithfully, LOWCOUNTRY.

[We trust some of our correspondents in Western India will send us an answer to our correspondent's queries; meantime, we may quote the following practical information on the subject of pepper cultivation from Porter's "Tropical Agriculturist":—"This plant thrives luxuriantly in most soils, and when once reared, requires comparatively little care and labour. The preference, in chosing a situation, is usually given to level grounds along the banks of rivers (provided they are not so low as to be inundated), on account of the rich vegetable mould found in those localities, and for the advantage of water carriage. Plantations of this tree are seldom made on rising ground, unless the ascent be very gentle; otherwise the soil is liable to be loosened and washed away from the roots of the vines. The goodness of pepper is considered to depend more upon the natural qualities of the soil than upon the care bestowed on its cultivation. It is a hardy tropical plant, and grows readily from cuttings or layers, rising in several knotted stems, which cling round any neighbouring support, and adhere to it by means of fibres that shoot from every joint at intervals of from six to ten inches, and through which it probably imbibes its nourishment. If left without any means of climbing upwards, the stalk, unable to support itself, creeps along the ground. The fibres at the joints then become roots, but in this situation 'the plant would never exhibit signs of fructification.'*

"Like ivy, it is encouraged by support to throw out bearing shoots. If left in its natural state it climbs to twenty or five-and-twenty feet high; but it is more fruitful when not allowed to attain this height. Restrained in its growth to from twelve to fifteen feet high, it bears both foliage and flowers within a foot of the ground; but, in the former case, the lower part of the stem is entirely devoid of these.

"In order to give to the pepper-vines the support they require, it is usual to plant some other trees with them for that purpose. The jacca tree (*Artocarpus integrifolia*) is selected in Malabar thus to lend its support, since the same soil is equally well adapted to the growth of both plants. In Sumatra a thorny tree, called by the natives chingkariang (*Erythrina corallodendron*) is employed. In Borneo the vines are supported, like hops, by poles; but there is a great disadvantage attendant on this method, as the poles thus exposed decay at the end of two or three years, while the plants last many years, and they are much injured in the removal of the old poles, and the placing of new ones. Besides this, the use of poles has another disadvantage in the absence of foliage, which, during the dry season, is of service in sheltering the vines from the too ardent rays of the sun.

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* Marsden's Sumatra,

"When a piece of ground is to be converted into a pepper plantation, it is marked out by means of a line into regular squares, having their sides about six feet, the intervals at which the plants are intended to be placed from each other. The points of intersection are noted by slight stakes, and at each of these points a tree intended for the prop is planted; for this purpose cuttings of about two feet long are put into the ground a span deep; sometimes cuttings six feet long are used, but these often fail, are not so vigorous as shorter ones, and generally grow crooked."

"When the shoots of chinkariang are twelve or fifteen feet high, a height they usually attain during the second year of their growth, they are topped, and not allowed to grow much beyond this altitude. The branches are lopped annually at the commencement of the rainy season in November, leaving little more than the stems, or otherwise the droppings from the leaves might injure the vines."

"The usual mode of propagating the pepper-plant, is by cuttings of a foot or two in length taken from the horizontal shoots, which spring forth from the foot of the old vines. One or two of these cuttings are planted close to the young chinkariang-tree, sometimes as soon as the latter has taken root, but oftener after a lapse of six months from its first being planted—a few cultivators allow an interval of twelve months, fearful lest the growing vine should overpower its support; but in general, if this be a healthy and vigorous shoot, so long a period of priority is unnecessary for its thriving, as it advances in strength and growth in proportion as the vines requires its sustaining power. The vine rises about two feet in the first year, and four or five more in the second; at this time, or between the second and third year of its growth, it first begins to put forth blossoms. In the rainy season which succeeds the first promise of fruit, the entwining stem is uncoiled from its support, and placed in a spiral form into a hole dug in the ground for the purpose, close to its root, leaving only the top of the plant above ground; it soon re-ascends the chinkariang-tree with renewed vigour, and in the ensuing season the plant, then eight or ten feet high, usually bears a ful crop of fruit. If this operation be performed too soon, the vine will not be forwarded than those newly planted, and will not bear fruit until the third year. On the other hand, if delayed beyond the proper time for the sake of saving the first fruit, the produce is ultimately retarded, although the desire of a present good, in preference to a future greater advantage, sometimes incites the cultivator to adopt this plan, and to omit turning his plants down until he has gathered in a premature harvest. During three or four years after the first crop, the produce annually increases; a plantation of about seven or eight years' growth is then in its prime; it continues in this flourishing state from one to four years longer, according to the fitness of the soil, and then gradually declines for about the same period, till it is no longer worth the labour of keeping it in order. Fruit has been gathered from some plants of twenty years' growth, but that is a very uncommon circumstance. As soon as there is any appearance of decline in the crop, the plantation should be renewed, or rather another garden should have been planted to succeed it, so that it may come into full bearing at the time required. The vines sometimes grow bushy at the top, when they must be pruned or thinned by hand; the flexile stems generally entwine to the top of their support, and then bend downwards, having their extremeties, as well as their branches, loaded with fruit. In the early growth of the plant it is immaterial how many stalks grow to one root; but when it begins bearing fruit, then only one or two stems should be suffered to rise and cling to the prop; more would weaken the root, and cause it not to bear so abundantly. All suckers and side-shoots must be carefully removed. Some which are healthy and of vigorous growth are usefully employed; trenches are cut to the neighbouring props where the vines have failed, through these superfluous shoots are conducted, and thence soon ascend round the adjacent tree; otherwise they are at once separated from the parent root, and transplanted to other spots; by which means the plantation is of uniform growth, though many original vines may not have succeeded. These shoots may likewise go to the formation of new gardens."

"The ground is always kept well weeded. During June, July and August, the finer kind of grass is permitted to remain on the ground as a protection against the rays of the sun, and as the means of preserving and attracting the dews, which are then heavy. As the vines increase in size, less care is necessary in clearing the ground, since the shade prevents the weeds from growing."

"Plantations are divided into gardens containing from five hundred to one thousand plants. Industrious or opulent cultivators have sometimes gardens containing as many as two or three thousand vines. These gardens are commonly separated from each other by hedges of shrubs, and have an open border of twelve feet wide round every garden. The gardens are kept with scrupulous neatness; 'no rubbish. not so much as a stick or a straw, is to be found on the ground.' Their symmetry and neatness give to them an appearance of beauty, although this very symmetry deprives them of the picturesque appearance admired by lovers of nature. Should the season happen to be dry, the cultivators are indefatigable in giving to their plants the necessary moisture; nearly their whole subsistance depending on the success of their crop. In very dry weather the blossoms are liable to fall untimely, or to be shaken off by high winds, in which cases the crop fails. To guard against this latter accident, the gardens are usually placed in a sheltered situation. Long continued drought arrests the progress of vegetation, but does not destroy it. We learn in Marsden's History of Sumatra that in 1775 there were eight months of continued drought; no foliage appeared on the pepper plants, and their general destruction was expected; but when the rain at length came, the blossoms appeared in a profusion unknown before. Old gardens which had been unprolific for one or two years, then put forth flowers and bore fruit, so that the crop of 1776-7 was unusually abundant."

"The customary time for gathering the principal crop is in September and October; another small crop is obtained in March and April. Sometimes the gathering continues at intervals the whole year round; sometimes only one crop is taken, the growth being irregular and dependent on the season. From the first appearance of the blossoms, a period of four months elapses before the berries arrive at maturity. But the blooming is not simultaneous, and there are to be seen, growing together on the same vine, clusters of flowers green fruit and berries already in a fit state for gathering. As soon as any of the berries begin to redden, and it is thought a favourable time for collecting them, they should be plucked, for if delayed too long they fall off. The natives make use of small triangular ladders made of bamboo, with which they go round the tree and reach all the fruit, which is collected in small baskets slung over the shoulder of the gatherer. It is then conveyed by women and children to a smooth level spot of clean hard ground, and there spread on mats to dry in the sun. The vicissitudes of the weather are not thought to injure it in this stage. As it dries it is occasionally rubbed with the hand to separate the stalks from the berries, which soon become black and shrivelled, and assume the well-known appearance of the black pepper of commerce. When dry, they are winnowed in large round shallow sieves, and put under shelter into vessels made of bark, until all the crop is gathered in and dried, or until there is a sufficient quantity to be carried to the factory. That gathered in the properest stage of maturity will shrivel the least; if taken off the tree too soon, it will, after being dried, quickly become mere dust."

PEPPER CULTIVATION IN THE SOUTHERN PROVINCE, CEYLON.

To the Editor "Ceylon Observer."

Udugama, Feb. 8th, 1883.

DEAR SIR,—I send you herewith the notes I made on pepper Cultivation at Singapore and Johore, and also the best means, as far as my experience goes, of cultivating it in Ceylon. I hope to see pepper cultivation largely taken up in Ceylon. I may say that I tested the amount of crop by getting a vine stripped and weighed. I took a fair average vine. Mr. W. Bailey, now in Johore, and Mr. Bagot, since returned to Ceylon, were present and I had the benefit of Mr. Bailey's Chinese conductor to interpret my questions. The export of pepper, as you are aware, is a very valuable one from Singapore, and there are any number of situations in Ceylon where it can be grown, just as well as in Johore. I have on some of my vines ripe pepper at 18 months old, but these are only a few exceptional ones. . . . —I remain, yours faithfully, T. S. Dobree.

Mr. Dobree's Notes on Pepper Cultivation.

Line 7×7 feet; choose flat or slightly undulating land. If at all steep land is used, it should be *terraced* at once. Cut holes 2 feet square by 15 inches deep, and fill in with good soil free from all stones and roots. Don't heap up the earth when filling in the hole, but rather leave a hollow to catch all moisture. At the lower corner of the hole put in a post of split wood 12 feet long by 10 feet out of ground and about 8×8 inches square. This post must be of good hard wood, and have the end that goes into the ground cleaned and tarred. The vines at Singapore last for 20 or 30 years old, still bearing well, and the posts that had never been renewed were still standing.

These posts are the most expensive* part of pepper planting, and I doubt, from what I know and what I have seen, whether they will be suitable for Ceylon, where white-ants are much worse than in the Straits; they, no doubt however, succeed admirably for the purpose in Singapore. When suitable posts cannot be obtained, I advise putting in cuttings 6 feet long of either "imbul" (cotton tree), "suriya" "eabudda," or "hikgas." I was told that the imbul or cotton tree is thought in Java to be the most suitable line tree to grow pepper on, and I find it the best down here. When the shoot from the cotton tree cutting or plant has grown to 10 feet from the ground, it should be topped and always kept as a pollard, both to prevent the pepper vine being shaded, and to keep the vine from running up too high. The cuttings must, of course, be put in weather.

I also tried jak trees, putting in two jak seeds in every pepper hole. I found, however, that the growth of jak trees varies very much; some of my trees grown from seed put in June 1881 were 5 or 6 feet in December 1881, others were 1½ foot. Monkeys also pull out the jak plants, and crickets nip off the tops. I therefore consider cuttings of the cotton are better, especially as they give something for the pepper vine to get hold of at once. Cotton tree plants can be used, and are easily raised from seed. When planting put three cuttings or two good plants in each hole; both cuttings and plants should be 18 inches long when planted out. **If plants are used,** put their root end as far from the post **as the hole will allow,** and bury all the plant except the head **and about** 4 **inches;** this will cause the plant to throw out roots **from** all the buried points and increase its powers of absorbing **manure.** As the plant grows, keep it buried till it reaches **the post** or cutting it is to grow up.

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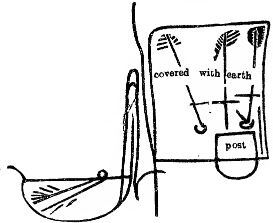
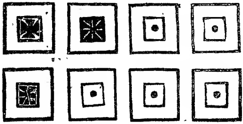
* From R70 to R150 per acre—889 posts per acre.



Plant the cutting or plants about 6 inches deep and shade *well* with fern—or some suitable and cheap substitute.

The Chinese make a small mound round each vine, but I think in Ceylon, where we have heavier downpours of rain, it is better to cut small drains 1 mamoty wide and deep between *every* row (the usual 18-inch drains 1 chain apart must also be cut) both up the hill and across, so that every vine shall stand in its own space. The earth from these drains will form a slight mound round the holes, and into this hollow all manure should be put. The Chinese never dig in their manure but just lay it on the surface.



This work need not be done till the clearing is planted

The Chinese commence manuring (with burnt earth chiefly) directly the cuttings are planted, and manure twice a year when they can afford it; once always. Burnt earth, cattle manure, fish, and I think limes and punac would be the best. In some places, I believe in Sumatra, they let the vine run up to 5 feet, then take it off the post, and bury it in the ground, leaving the arch out of the ground, from which two or three suckers grow, and are trained up the post.

The Chinese in Singapore and Johore, who are said to be the best cultivators of pepper, do not do this, but plant their cuttings as I have described. They always use *cuttings*, and only the ends or tops of branches, which they put in a shaded nursery to root before planting out. I myself have found *plants* much more certain than cuttings and hardier, but I was not able to obtain cuttings of the ends of branches only. The vines commence to bear at 2½ years old. I saw a garden of this age in Singapore. The vines were about 6 feet up the post but bushy at the bottom, and had a maiden crop on them.

5 years old in full bearing.

2½ years old.

I can't estimate how much an acre, but I think it was about 600 lb. per acre.

From a good old average vine—said to be 30 years old—I saw 30 lb. of green pepper taken and weighed. I saw several gardens that I believe *averaged* as much as this vine.

As pepper dries down to one-fifth of its green weight, this would be 6 lb. of marketable pepper, or at 889 vines per acre 5,334 lb. per acre for the autumn crop, and the Chinese said they got as much more for the spring crop. I did not see any spring crop, so cannot vouch for the truth of this total: say 10,000 lb. per annum. I don't believe this.

The Chinese never, as far as I saw, plant more than from 10 to 15 acres of pepper in one garden along a carefully selected basin, and they cultivate each vine very highly, so that there are no bad vines in the whole acreage, until the garden is old and worn out.

A good average crop of pepper, I have been told on reliable authority, is about 28 piculs an acre or say 33 cwt., or rather over 4 lb. of prepared pepper per vine. The price of pepper in Singapore now $15 per picul, is very high, and I was told that $10 was a safe price to calculate on. This would give 28 piculs at $10 = $280, or say about R600 per acre as the value of the crop, and putting down the cultivation at the extremest limit of R200 per acre per annum, leaves a profit of R400 per acre. This sounds almost too good to be true, but I feel certain these profits are made out of the pepper gardens in Singapore and Johore, and there is no doubt that the Chinese have made very large fortunes from this cultivation. The preparation is very simple. The Chinese use a very rough drying drier something like the ordinary Sinhalese lime-kilns with warachies on the top and matting on which the pepper is spread to dry with fire underneath. White pepper is made from the best and ripest berries. It is placed in heaps for several days to ferment and then trampled out and washed and dried very much in the same way as coffee. Pepper is sent to England in bags of 142 lb. each. It is taken at 16 cwt. to the ton for black pepper, and 18 cwt. for white. By using winnowing and sizing machines, I am sure we would very much improve on the samples of Singapore black pepper, especially by picking out the grey peppercorns, for which work labour is too dear in Singapore. *One penny* per lb. covers shipping, insurance, loss on weight (which is from 6 to 10 per cent), brokerage and freight. Pepper damages tea, and some ships refuse it. The lowest price it has ever been down to is $6 per picul many years ago. For the last five years it has averaged from $10 to $15 per picul.

A free rich soil is the best, and a continually wet climate. A long drought is said to cause the berries to fall off the branch before they are ripe. I could hear of one disease or blight that affected the vines, and certainly saw none on any of the many gardens I visited. The crop is picked with light step-ladders, the branches are picked whole, as soon as some of the berries begin to turn red and yellow. I don't think it possible to get all the berries on a branch ripe before it is picked; some would fall off before all were ripe. I consider good chena land, if not steep and washed, as better for pepper than virgin forest, unless all the logs and roots of the latter are cleared away, for it is extremely difficult to work up pepper as it should be done with the logs and roots on the ground. The vines that grow over the old *stumps* of large trees are always the finest, as they seem to derive nourishment from the rotting timber.

PEPPER :—COST OF CULTIVATION.

1st year.	*Per acre.*
Superintendence	R10·00
Felling,* chena	8·00
Nurseries	10·00
Weeding 8 months	8·00
Lining	1·50
Holing	9·00
Filling in	9·00
Draining and Roads	12·00
Planting and Shading Pepper	6·00
Planting Cotton Plants	2·00
Tools, Buildings, Contingencies, etc.	20·00
	R95·50

2nd year.	
Superintendence	R12·00
Nurseries	2·00
Weeding	12·00
Roads, Drains	1·00
Terracing	8·00
Manuring	5·00
Pruning and Training Vines	3·00
Supplying	1·00
Buildings, Contingencies, etc.	10·00
	R54·00

3rd year.	
Superintendence	R12·00
Weeding	12·00
Roads, Drains	2·00
Manuring	10·00
Pruning, Training Vines	3·00
Supplying	1·00
Building, etc.	10·00
	R50·00

The 4th year's crop quite cover expenses, but I cannot state the cost of picking and curing. I believe that for such districts in Ceylon as those round Galle, Avisawella, Yatiyantota, and in fact all the south-west of the island, pepper will be one of the most remunerative products, if care is taken in selecting suitable localities for planting it. All ridges should be left in jungle so as to have plenty of earth available on the spot for using as manure when burnt. The Chinese pepper gardens are all surrounded by forest which, for about 2 chains from the pepper, have the earth for a foot deep at least all carried off during the course of years as manure.

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* The cost of item will depend on whether cuttings can be bought close at hand, or plants are raised from seed.

I have forgotten to state that the vines should in no case be allowed to run up to the top of their post or pollard, until they have thickened out below. When the runner is 2 feet high the top should be nipped off to make it throw out laterals, and the vine should always be kept in the form of a sugar-loaf until it has got thick and bushy from the ground to the top of the pollard. If not stopped and made to thicken out, one single runner will get up to the top of the post or pollard in a year or 9 months' time and never become a good bearing vine.

We have now 130 acres of pepper planted at Udugama on 5 estates, all coming on well, and the land selected as nearly as possible in the same way as I saw done by the Chinese at Johore. T. S. DOBREE.

PEPPER CULTIVATION ON THE WEST COAST OF INDIA.

To the Editor, "Ceylon Observer."

BEYPORE, 20th April.—Referring to your enquiry *re* pepper cultivation sent to our Coimbatore friends, we have obtained the information we think you require, shewing how pepper is cultivated on this coast, and enclosed same.—STANES & CO.

THE PEPPER SHOULD BE PLANTED IN LOW, FIRM GROUND.

In the beginning of the month of June, when the rain falls incessantly, at the foot of a jack, mango, cajon, marcim, or any other trees whose bark is rough or prickly, dig a hole one foot deep, the breadth and length six inches. Into this hole put a cutting from the extremity of one of the branches of a pepper vine, then fill it up with earth, taking care no water is therein, and that none may remain after planting. In the month of July roots will extend themselves in the ground and the sprouts will appear on the surface, when they are to be tied to a tree, and a circular bank of earth thrown up round them that they may enjoy the moisture of the water, which remains on the ground and sheltered from the heat that prevails from the month of July to October. When the rains cease, cover the root of the vines with fresh leaves, it matters not from what tree, so that they have the quality of cooling. If the ground is too dry, water the same morning and evening; but, if it is entirely cool, twice in eight days is sufficient. Then plant five or six sprigs at the foot of the same tree, taking particular care that they in no wise touch each other. Ten days after the rains set in, remove the leaves that cover the root of the vine, pull up the grass that may have grown near them, and demolish the circular bank of earth made to contain the water, that none may remain at the foot of the tree. In the month of August repeat the same. The vines are to be cherished in this manner for three years. It must be observed that the foot of the vines should be covered every year in the manner before-mentioned. If the vine is once smothered by the heat, it will begin to languish and produce no fruit, so it is necessary to follow the above instructions. The leaves ought likewise to be removed in the month of June, to prevent the white ants from reaching the root of the vine.

THE MANNER OF PLANTING IN THE MONTH OF FEBRUARY, WHEN THE GROUND IS LOW AND FIRM.

Having made holes ten inches from the tree, the depth thereof being fifteen inches, the length and breadth twelve inches each, take seven branches from the extremity of the vine, cut them thirty inches long, and put them into the hole; then fill it three quarters with earth, and the remainder with fresh leaves, observing to put water thereon, morning and evening, till the commencement of the rains, when fill the hole with earth, and throw up the bank as before directed. The time for planting these vines, in the rainy season, is in the month of June; and in the month of February in the dry season. If they are planted at any other time, they will not bear fruit. Trees planted for the support of pepper vines ought to be fifteen or sixteen feet as under. If closer, the branches will shade the vines from the sun, and they ought to receive a moderate amount of warmth.

MANNER OF PLANTING IN THE HIGHER SITUATIONS AND FIRM GROUND.

Make a square whole fifteen inches, the same distance from the tree, take ten branches from the extremity of the vine of seven inches length each, put them into the hole of a certain distance, filling it with earth and treating them as before directed. Two years after they are planted it is necessary to throw up a square bank of earth round every five plants that the rainwater may soak in and nourish the roots. If this is omitted during the rains, the vine will not subsist during the dry season, on account of the heat. This square is to be repaired every three years by which means the vine will live a long time and produce plenty of pepper; it ought to be done during the rains, in the month of July.

MANNER OF PLANTING IN VERY HIGH GROUND.

Make a square hole 2½ feet deep, at the same distance from the tree, take 12 slips from the extremity of one of the vines, two feet nine inches long, put them into a hole at a certain distance, and cover them as before directed throwing up the square bank. It is necessary to plant these vines at the time before-mentioned. The reason for making the hole deeper is on account of the heat which prevails on high places. Vines planted in a strong soil will not produce any fruit, because the roots cannot extend themselves with facility.

A sandy soil is equally prejudicial to them because it is naturally hot; and the heat of the sun penetrates with more facility than in any other ground.

You may plant vines in a place where fresh water communicates itself in the same manner as in ground entirely low and firm; but I doubt very much if they will produce pepper. If they yield any I am certain the grapes will be of no great account, because of the continual moisture the plant will receive. I have already remarked it is absolutely necessary that the vines enjoy an equal degree of heat and moisture, if you think of gathering a good crop.

Manner of Planting the Pepper Grain.

Take ripe pepper and put into water three days, at the end of which take off the skin, and, after you have mixed good red earth, with cowdung and water, put the pepper into it, exposing the same to the sun for three days, early in the morning and evening; it is necessary this mixture be neither too thick nor too thin. After this plant the same in an earthen pot, every grain at a certain distance, taking care to water them every day with a water pot, until the stalk has four leaves. Then dig a hole at the foot of a tree, two feet deep and nine inches long and broad, take cowdung and ashes of all sorts of firewood, put it into the hole, and mix the same with the ground dug out of it, taking care to fill it in such a manner that there only remains five inches of elevation. Fifteen days after, plant four pepper vines in every hole, cover them with earth two inches deep; during the summer water them every day, morning and evening, and cover during the rains. Likewise take care that no water remains at their feet by covering them with earth. As soon as the rains are over, throw up a circular bank of earth round them to contain the water they are watered with. In this manner they must be nourished for three years; in the fourth year they will begin to give fruit. These instructions are to be followed every year. These proper plants are planted either in high or low ground, but it is necessary to be very firm.

Manner of Planting where Salt Water is.

After having made a hole, thirteen inches square, at the foot of a tree, fill the same half up with good red earth without mixing it in the least with salt water; then plant therein ten slips of those vine, at a certain distance, and cover the same with good red earth. When the rains are over, throw again red earth at their feet, and make a circular bank round them, to form a conservatory, for watering them every other day, taking particular care to cover the feet of the branches with fresh leaves. In the beginning of the rains fill the conservatory and take away the leaves, observing to pull up the grass that sprouts at their feet, covering them with red earth, at the same time spreading same round about, they are to be nourished every year, as is pointed out at the beginning of these instructions.—*Indian Agriculturist*, September 1878.

PEPPER GROWING.

The cultivation of pepper through simple is an interesting one and affords ample scope for the application on intelligence of a higher order than we are generally ready to accord to the coolies employed in the work. The lines are laid out seven feet apart and the holes dug two feet square by over one foot deep, the centre of the holes being seven feet apart in line. At one corner of the hole a split post six or eight inches square is put in having about ten feet out of the ground, The post should be of such wood as will not be readily eaten by white ants and tarred to prevent decay, for this post performs a very important part in the cultivation. It is usual to put three cuttings eighteen inches long into each hole in the opposite corner to the post, burying the cutting about six inches deep and for over a foot in length; it then throws out lateral roots from all the joints that are under ground which gives it ample strength to procure nourishment from the soil it is placed in. The cuttings are taken from the tops of the vine and are usually put in the ground to root before being planted out. The vines came into bearing in 2½ to 3 years and average half a chatty to the vine of the first crop, increasing to three catties in the fifth year. A vine is in full bearing when 6 to 7 years old, but continues to increase year by year if manured and not allowed to over-run or overbear itself in any one year. A fair average crop I am told is 20 piculs to the acre and a good crop 28 piculs to the acre. Of this product there are two crops a year. Black pepper is simply the berries dried. The white comes from the ripest berries which are let lie in a heap for some days to ferment, when the skins are removed by the coolies trampling amongst them; they are then washed and dried upon an improvised drying apparatus on which they are spread with a slow fire beneath. In order to make the vine throw out laterals and spread, it is topped when about two feet high. Such briefly is a sketch of the pepper culture, barring manuring, weeding and cost of laying out a garden, which I believe all included for the first three years does not exceed $100 per acre. The gambier is grown simultaneously with the pepper in order that the refuse may be used as manure for the latter. Like the areca palm and coconut of Muar, pepper and gambier are the staple products of this part of Johore, but are not confined to this part of the territory, being grown, I believe, at Sedilli on the East and Batu Pahat on the west. But as showing the large quantity now raised, I find that nearly two-thirds of the exports of these articles from Singapore are produced in Johore.—*Straits Times.*

PEPPER CULTIVATION ON ROCKS IN CEYLON.

Dr. Trimen says :—

"With regard to pepper, experiments in the lowcountry have shown that it is not a good plant to grow it over rocks, which in hot dry weather become much heated and shrivel up the plants. There are several varieties of black pepper in cultivation by the natives, and one is a superior sort, perhaps as good as any you could get, unless the choicest Travancore or Malabar sorts. The conductor at Henaratgada garden knows the peppers well, and could supply you with the right sort. We have tried the Singapore sort grown there so largely by the Chinese. It is lest of a climber than any of our sorts, and though it does well here at Peradeniya, it did not succeed in the lower country. If you think of trying foreign sorts, I should recommend you to get some from the Malabar Coast.

"*Cubebs* is another matter. I doubt if you will succeed in obtaining seed of this from anyone, that is seed that will grow. Of course it is easy to go into the bazaar and buy it, but such seed is useless, and that is what is generally sent from Netherlands India.

"As with ordinary pepper, cubebs are picked when full-grown, but before they are mature, hence even if fresh-gathered they are incapable of germination.

"*Ripe* seed is very rare, I imagine, the plant being propagated by slips entirely, and no fruit allowed to ripen."

PEPPER CULTURE.

Drumduan, Johore, May 2nd, 1888.

The Editor, *Tropical Agriculturist.*

DEAR SIR,—Seeing that some information about planting pepper has been asked for in the above publication, I take the liberty of sending you some notes on the same. I send them with the full knowledge of the *Singapore Free Press*, and trusting they will be of some use,—I remain, yours faithfully,

J. R. WATSON.

NOTES ON PEPPER CULTIVATION.

(By a Planter.)

Pepper.—(Nigrum). The plant affording black pepper is a perennial climbing shrub, indigenous to the forests of Travancore and Malabar, and cultivated also in Sumatra, Java, Borneo, the Malay Peninsula, Siam, the Philippines and the West Indies.

Cubebs (Piper Cubeba; Fr. *Cubebes;* Ger. *Cubeben; Cubeba officinalis).* The fruit of the Cubebs is very widely used in the treatment of gonorrhœa. The plant, a member of the pepper family, and a woody climber, is a native of Borneo, Java and Sumatra. The fruit is gathered when full grown, but before it has ripened; and is then dried. It has a strong aromatic and slightly acrid bitter flavour and a pleasant aromatic odour. The great similarity of the fruits of other species of *Piper* renders their confusion with the true drug an easy matter; they are principally *P. Crassipes* of Sumatra, *P. Lowong* of Java, *P. Ritesioides*, *P. Coninum* throughout the Malay Archipelago, and extends to *Laurus Cubeba* of S. China.—(From Spon's *Encyclopœdia of Manufactures, etc.)*

Climate.—A warm, moist climate, with an average rainfall of 80 to 100 inches annually, and evenly distributed, is most suitable for the successful growth of pepper.

Lay of Land.—A nice gentle slope, well protected from winds and with an eastern aspect, should be chosen if possible, but as regards aspect I do not consider it an absolute necessity, as I have seen pepper growing with other aspects, and doing exceedingly well.

Soil.—Light sandy soil must be avoided, as pepper likes soil of a retentive nature. The majority of the soil in the Straits is of this description, being composed principally or disintegrated granite and ferruginous clay, with a free subsoil and on top generally a few inches of vegetable mound. Pepper also grows well in well-drained swamps composed almost of pure vegetable matter. I have also seen it growing in magnificent volcanic soil, and the pepper, though very fine, showed clearly, both in wood and crop, that the soil was a little too free, and did not retain sufficient moisture during the hot weather.

Felling and Clearing.—This work if possible should be done on contract. The men commence by cutting down all the undergrowth and small trees and spreading these evenly over the ground. They then commence from the bottom of the clearing and work upwards, cutting all the trees half through. On the top of these they fell a "giant of the forest," and this brings down the trees immediately below and around it, and they in turn bring down the others. The men then proceed over the felled clearing, and lop off all branches, and if these latter are too large, cut them up also, all being spread out so as to cover the ground. When well dry, the clearing is fired. It is best to agree with the contractor to take the risk of the burn, as if it should turn out bad, he has to heap and burn again. Besides, if he takes the risk, he will be all the more likely do the work well.

Digging.—After the burn the clearing should be dug up entirely to the depth of one foot, all roots, twigs, etc., being carefully heaped and all small logs over six feet in length kept for temporary posts; but if labour is abundant, I advise permanent posts being split at once, in which case the small (6 foot) logs can be added to the pile of the roots, etc. I will, however, presume that the permanent posts cannot be split in time, so that temporary ones must be used.

Roads should be cut so as to give easy communication to every part of the estate. The gradient should not exceed one foot in twenty (*i.e.* a rise or fall of one foot in every twenty feet), as then the roads can eventually be turned into cart roads, making transport of manure cheap and easy. The extra outlay will eventually amply repay itself. Breadth of the road not less than 4 feet, and if it is to be eventually widened, the extra bit required for the widening should not be planted. Having chosen the line your road is to take, drive in a small peg (about 8″ long) to the level of the ground and beside it drive another peg (about 18″ long) so as to show where the level peg is. On the level peg place your tracer, after having adjusted it to the proper gradient. A cooly with the sighting pole should go on ahead about 25 feet or so, and when the gradient is found, a small peg should be driven in to the level. Another sight should be taken to see if all is correct, and another long peg driven in beside the level peg. The tracer is then brought in to the second level peg, and the work proceeds as before. When the road is cut a drain one foot deep and wide should be cut on the inside, and the road should have a slight slope in the direction.

Drains should be traced at the same gradient as the roads, but the level peg is not needed. They should be a chain apart and 18 inches deep and broad. Great care is needed in tracing drains, as if there be any deviation in the trace, the drain is apt to burst during a heavy shower. All drains should be led into the nearest ravine; but if that cannot be done, or the drain be too long, outlet drains should be cut, and care should be taken not to enter the cross drains in pairs, but alternately, and the last few feet should have a steeper gradient, so as to save the sides of the outlet drains.

Lining.—Pegs having been cut 18 inches long, a base line should be run at right angles to the road, pegs being placed seven feet apart. Some plant 8′×8′, but I consider 7′×7′ the the right distance. Having run the base line to the end of the clearing, a cross line must be run at right angles to the base line, and the pegs placed the same distance. A rope is then taken about 180′ long, and this is measured at regular intervals of 7′ and is marked off by a bit of coloured cloud. The rope should be measured 3 or 4 times a day, and always after a shower. The two ends are then tied to two sticks, and a cooly takes hold at each end. One man places the end rag on the rope at his end, on the top of the cross line peg nearest the base line. A man at the other end measures with a seven foot stick from and at right angles with the base line, and puts in a peg at the end of the measure. The rope is then pulled straight, and the pegs placed into correspond with the rags on the rope. The subsequent work is the same. Beyond the look of the thing I see no use in square lining, and a place looks just as well if lined as above. Lining 7′×7′ gives 889 to the acre, 8′×8′ gives 681, a considerable difference.

Holing.—At each peg a small hole should be cut, about a foot deep and large enough to take the temporary post, which should be firmly fixed in it. On the lower side of the post the soil should be dug up to a distance of about 18 inches from it, and about 9 inches deep and in a heart shape, the broader end being near the post. All rootlets, etc., being removed, the earth is piled up along the centre in a ridge leading from the post, leaving a hollow on three sides. It is then ready to receive the cutting.

Nursery.—Cuttings should be bought, or if they are vines, cut two months before they are required for planting. Each cutting should have not less than seven root joints and two branches, but three are preferable. When cut from the vine they should have all the branches cut off the seven joints which are to form roots, the next two or three branches left, and all above the top branch that is left should be cut off about half an inch above the joint, all such cuts being clean ones. Cuttings should not be taken from old vines, nor should old bark hardened cuttings be used, as in both cases they grow very slowly and never make good vines. In choosing cuttings, there is one kind which should always be rejected. It is difficult to tell it from a good cutting. It has the roots like the other cuttings, and may look healthy and probably does, but if carefully examined, an eye or even two or three will be seen at the root joints, and all is round and smooth, and the top and eyes will only keep on sending out branch shoots upwards without roots, and in clusters, and no amount of cutting down will change its growth. Having chosen a flat site close to water for your nursery, have it dug up to a depth of 15 to 18 inches, and all roots, etc., removed. Put over this a covering about 5′ 6″ high, and thoroughly shade. Divide the ground into beds 4 feet broad and any length, having paths between each bed, paths being either on the same level, or even raised *above* the beds slightly. Begin at one end of a bed, and cut a trench across deep enough to take the cutting as far as the lowest branch. The top side of the trench should have a slight slope, and against this slope the cuttings should be laid roots downwards, and about three inches from each other. The cuttings having been placed in the trench as described, against them a sloping bank of soil, about 4 inches broad, should be laid, and against this bank another layer of cuttings, which are again covered like the first row, the subsequent layers being placed the same way, so that cuttings will be 3″ × 4″ apart. Immediately after being planted they should be watered, and should have water regularly morning and evening and sufficient to thoroughly sink into the soil. Of good cuttings, about 5% die in the nursery. Care must be taken that the lowest fork formed by the stem and branch of the cutting should not be buried.

Burnt Earth.—It will be noticed that under the heading "Digging." I have recommended all roots, etc., to be heaped. Before the planting is taken in hand, all remaining timber, not wanted lying in the clearing, should be added to these heaps, the latter should be carefully covered with soil and fired. Any green stuff added to the heap would be all the better as it would check too rapid burning. Should the earth be burnt red like a brick it is almost worthless. When the heap is burnt all charcoal and unconsumed wood must be raked or sifted out, and the heap left to cool.

Planting.—The clearing now being ready to receive the plants, directly the rains have well set in, this work should begin. The cuttings should be carefully taken from the nursery and carried to the field in covered baskets. Never take too many cuttings at a time. Each man should have a mamotie and from 15 to 20 plants. He begins by opening up the ridge down the centre of the hole and from the post, to a depth of 9 inches or so and at a slope. In this the cutting is placed, roots downwards with the head (which by now should have from 2 to 3 shoots growing) well out of the ground and resting against the temporary post. The plant should be carefully covered, the soil being heaped as originally, and immediately and thoroughly shaded, too much of the latter being perferable to too little.

Application of Burnt Earth (the first).—Directly the plants have well started, about 40 lb. of burnt earth should be applied to each vine. In applying it should be put on the surface (the soil having previously been slightly loosened) and about 6 inches from the post.

Tying.—The shoots which grow from the fork, formed by the branch and stem, should be trained straight up the post. In no case would I allow more than two shoots to grow. These as they grow should be tied at every joint, but not too tight, and the material used for tying should be flat. Some allow all the branches to remain on until the vine is "let down." I advise that, with the exception of 4 or 5 branches at the top of each vine, the others should be cut off during the tying process. Care should be taken that, if possible, the three upper branches should have no barren joint between them. My reason for cutting off the branches during growth is that the wound has time to heal, and no risk is run of the plant rotting at one of the freshly cut joints when "let down." In tying, never tie any of the branches but merely the stem, and below each joint.

Permanent Posts.—Splitting of permanent posts should commence directly after planting, as this is the slowest, hardest, and most expensive work of all. The posts should not exceed 13 feet in length, and should not be less than 6 inches in diameter. The hardest and best timbers should only be used. At the end will be found a list of timbers suitable for this purpose. For the work, each man will require an axe, a wedge-shaped axe, measuring about 12″ × 3″ × 2½″, and two iron wedges measuring about 18″ × 3″ × 3″, and a chisel 24″ by 2″. Unless used immediately, split posts should be laid flat on a raised scaffolding until required. This will keep white ants off. One good man will cut up and split, on an average), ten posts a day.

Letting down.—When the vines have reached the top of the temporary post, they should be taken off and buried, otherwise called "let down." This requires great care, and is done as follows:—The man begins first by removing with his mamotie all sand, stones and rubbish within a radius of two feet of the post. He then with a blunt pointed stick digs back on both sides of the part of vine which is in the ground (taking care not to break any of the large lateral roots) until it comes to the end of the original cutting, from which he will find from one to half-a-dozen of what may be called tap-roots growing. On reaching these latter he stops digging, but releases all the other lateral roots by digging along them until he reaches the end. However, should any of the lateral roots go beyond the radius of two feet I would not follow them to the end. The object in following the lateral roots is to find out in what direction they run, as otherwise they may be cut in two in digging the hole for the vine or permanent post. On no account loosen the tap root or roots. Having laid bare the roots, the vine is next detached from the temporary post and laid flat on the ground, out of harm's way. The post is then pulled out of the ground, and in its place a hole is dug large enough to take a permanent post, and 30 inches deep. The permanent post is then firmly fixed in the hole. I have not tried it myself and do not know if others have; but I do not think it would hurt the vine if the lower end of the post were to be tarred. Having fixed the post the ground should be dug up and the soil pulverised within a circular area of two feet radius from the post, and to the depth of one foot, leaving a space of 4 to 6 inches directly round the post untouched. All bits of wood and rubbish must be carefully removed. The hole, or more properly trench, thus cut must be at the same level as the end of the original cutting on which the tap root starts, and this level must be carried all round. The vine is then laid, roots down, in a circle in the hole, and about 15 inches from the post, and the end where the branches are, must be tied to the post, care being taken that the fork of the lowest branch be not buried. Should there be a double vine, the odd one is carried away from the trench, and the head fixed on to a post placed slantingly in the ground, a stick being placed to mark where the two vines join. The vine or vines are now covered in, the soil being gently pressed down with the hands, and the space levelled. A hollow should not be left as water will collect in it, stagnate and rot the vine. Should any portion of the vine be damaged in letting down, that portion should not be covered, but left exposed until hardened, when it may be covered like the other portion. The portion of the vine above ground should be tied below every joint. The odd vine when well started can be cut off from the main stem and used as a supply which can be let down on a permanent post direct, thus saving at least six months. This latter I advise being done only in wet weather, and the supply thus put down must at once be thoroughly shaded, the shade not to be removed until the vine has get a good start, and even then the removed being only gradually effected. The other work can be done in almost any weather.

Application of Burnt Earth (the Second).—While the work of letting down is proceeding, men should be put on to make burnt earth. I advise it being made in jungle this time, as from the mould being added it is richer. As each vine is let down, about 80 lb. of burnt earth should be applied on the surface, and all round the vine, and about six inches away from the post, the soil being first gently loosened.

Pruning, Topping, Tying.—The vine having been let down, it should be allowed to grow about three feet up the post having been tied at each joint as it ascended. It should then be cut down to above the third or fourth branch, thus leaving three or four forks, and the cuttings either sold, should there be a sale for them, or put into the nursery for supplies or extension of cultivation. If cuttings are not wanted for supplies, sale or extension of cultivation, the vine can be topped above the third or fourth branch directly it is let down. From these forks either two, three, or four shoots will be thrown out; in some cases, however, there may be only one. In the latter case, let the shoot grow to a foot or so, and again cut it down, when it is certain to throw out two or three other shoots. These shoots should be trained up the post on three sides, or if there be only two shoots, on two sides equidistant from each other. The material used for tying should be passed over the three shoots, provided of course they are all equal in growth and should be tied below joints. Each shoot, as it grows, will throw out branches alternately. Should however any of the shoots fail to do so, it should be immediately topped below the barren joint, provided cuttings are not required. In the latter case, allow the vine to grow to about two feet, and then top it below the barren joint. If cuttings are required, allow the vine to grow up to about 5½ feet, then cut it down to three feet, but if not wanted it can be topped when it reaches the height of three feet. The object in stopping the growth is to force the sap back, to allow the vine to spread out, and to strengthen it generally, as otherwise it will grow up long and scraggy. Attention to this operation will make a difference of at least 50 per cent. in the crop. During its growth the vine will be constantly throwing out blossoms, which should be nipped off. On a ten feet post, the vine should be topped three times, the third time as it reaches the top, when the shoots composing the vine should be tied together and topped. As the vine is topped every three feet or so, that portion should be tied with some strong material, small unsplit ratten being used in the Straits. All subsequent handling consists in stopping the upward growth of the vine and keeping all suckers and shoots down. The vine should reach the top of the post in between three and four years, according to soil and cultivation. I would not allow the vine to bear until it has reached the top of the post. The Chinese, however, begin to pick when the vine is from two to two-and-a-half years old, but they allow it to bear gradually from the bottom upwards. A vine is fully matured when five years old.

Manuring and Manures.—After letting down, vines should be manured at least once a year. From the time of coming into bearing, always twice a year. Time of manuring—in dry or showery weather. The Chinese use only burnt earth and fish manure, but chiefly the former; and there is no doubt that it has a wonderful effect. Besides the abovenamed manures, liquid cattle manure, applied during dry weather, has also a wonderful effect. Before using bulky manures they should be burnt with the addition of earth mould, the same way as burnt earth; otherwise they will attract white-ants and root-destroying insects of all sorts. I have seen castor-cake applied both to the surface and below the soil. The result in both cases was the death of the vine. In a dry climate or in dry weather, I strongly recommend thatching. Manures should be applied on the surface, but may be lightly covered with soil. Forking should not be done as the risk of injury to the roots is too great. As far as I am aware bones, poonac, lime (pure) or guano have never been tried.

Crop, and Picking and Curing.—There are two crops a year, **December—January,** and July—August. When the bunches **have turned** a dark green colour, they are ready to pluck. **This is done** by nipping off the bunch whole. It is then dried **(by the Chinese** on mats placed about 6 feet above the gambier **furnace)** either by fire heat or sun heat, is then separated **by rubbing** on a rough surface such as a mat and is subsequently put through a fanner, packed in bags and is then ready for despatch. This is Black pepper. White Pepper is good by fermenting or, more properly speaking, soaking for several days the berries that have turned or are on the point of turning red. It is then stamped out with the feet to remove the outer skin, washed and dried in the sun. I have no doubt that with a drier, separator and fanner, better work and finer pepper than is obtained at present can be readily turned out. The following may be considered a safe estimate of crop per vine; for the 3rd year, 1 catty; 4th year, 1¼ catty; 5th year, 3 to 3½ catties; a catty being 1⅓ pound.

Buildings.—Should cattle-sheds be built, I strongly advise that the floor should be rendered as water-tight as possible so as to lose no urine. Near all coolie lines, too, there should be a covered-in pit, and tubs should be placed along the verandahs to receive waste rice and rice water, etc., as by these means an enormous amount of valuable manure can be collected. Should cattle be kept, I strongly advise a few pigs being kept also. For plans of buildings suitable for an estate I can recommend *The Ceylon Planters' Association's Prize Essay on Buildings*, by Messrs. Owen and Ballardie.

Enemies of the Pepper Vine.—The pepper vine, like most other economic plants, is subject to disease and attacks from insects. Its chief enemies are white-ants, black-bug, white-bug, borer, mole-cricket, cinchona-caterpillar and a certain insect belonging, I think, to the *Hemiptera.*

Cures and Preventive Measures.—A strong solution of Tuba root is quite sufficient to keep away white-ants. Tuba root is used by the Malays and Chinese to poison fish in rivers, and is common all over the Straits. Black and white bugs can be got rid of by applying a solution of Tuba root and the juice of common damaged tobacco. In mild cases, ashes, lime or sulphur and lime, applied early in the morning, will be found sufficient. Borer begins always by attacking the joints of the branches and its presence is known by the light yellowish colour of the bark. I know of no prevention, and provided it has not gone far, it can be easily caught. It always works round the joints, and when it has completed the circle, it commences to bore down the centre of the branch and sometimes, but very seldom, the stem. The mole-cricket goes for the roots, but does the least damage of all. If it has gone too far to dig out, I can only recommend the hole being plugged up as far as possible with clay. The green cinchona-caterpillar attacks the leaves only, but of these it is capable of devouring an enormous quantity. The only way to get rid of it is to send a cooly round to collect and destroy them, The last mentioned insect (*Hemiptera ?*) **only appears in dry weather and sucks the juice from the young shoots and branches, generally killing the latter. It is to be found at the junction of the branch and stem. I fancy a weak solution of kerosine and water would clear them off, say a wine glass of oil to a bucket of water.**

Timbers.—In the Straits I would only recommend the following timbers to be used for permanent posts :—

Tampenis (*Slœtia sideroxylon*). Red, very hard, close grained.

Krangee. (*Dilum indicum*). Dark red, hard, close-grained.

Panaga. (*Adinandra Dumosa*). Bright red, hard, cross-grained.

Tumboosoo. (*Fagræa Peregrina*). Very hard, close grained, long fibre.

Billian. Hard, heavy, close grained (called Billian Wangy).

Ballow. Colour dull gray.

Kulim. Very like Ballow.

Rassak. (*Vatica species*). Red is the best.

Darroo. (*Apodytes species*). White, close grained, agreeable smell.

Tambaga; Damar Putih; Bawang, light yellow and smells like an onion. Kayu Kuning, I think, is another name for Kulim. Rungas (*Gluta velutina*), a handsome wood used for furniture making, dark red with black veins. Lasts well. The above timber list is partly taken from the *Tropical Agriculturist.*

ESTIMATE OF EXPENDITURE.

To these rough notes I append an estimate for opening and bringing into bearing 10 acres of Pepper. Rate of pay 30 cts. of a $ per cooly.

	$
Felling, Clearing and Burning (Contractor taking risk) ..	70
Digging one foot deep, heaping all roots for burnt earth and keeping trees for posts	300
Lining, Cutting pegs, etc.	15
Roads 4 foot	20
Drains 18 inches	20
Temporary posts with carriage	200
Holing, fixing temporary posts	19
Nursery plants $120, cost of nursery and watering $70 ..	190
Planting and Shading	25
Burnt earth	72
Tools, contingencies	150
Weeding for six months at 40 cts. per acre	24
Application ½ pic. burnt earth	30
Tying, one man, 1,500 vines	54
Nursery—plants $17. Cooly $27; vacancies 15% ..	44
Supplying and Shading	10
Upkeep Roads and drains	30
Contingencies	50

	$
Expenditure (Total) Pepper 6 months old	1,323
Permanent posts 889; says 890 to the acre	360
Letting down	340
Transport of posts (this depends on distance)	400
2nd application of burnt earth one picul. Burning and applying	170
Supplying and nursery	57
Upkeep Roads and Drains	54
One man tying 1,500 vines for 6 months $54. One man tying 500 vines for 6 months $162	216
Weeding at 45c. per acre	54
Contingencies, purchase of ladders, etc.	100
Total expenditure Pepper 18 months old	3,074
Tying, one man, 500 vines	324
3rd application of burnt earth, burning and applying	340
Nursery	54
Supplying, shading	15
Weeding at 50c. per acre	60
Building a small store	300
Purchase of small dryer, fanner	120
Curing and transport of 45 Piculs Pepper	45
Contingencies, Tools, Sacking	150
Total for Pepper 2½ years old	4,482
,, ,, (one year) 3½ years old	1,000
,, ,, (,,) 4½ ,,	1,200
Total	$6,682

CROP :—

Sale of 50,000 rooted cuttings in 2 years, $15 per 1,000	750
Sale of 45 Piculs Pepper off 2½ years old vines	675
Sale of 134 Piculs Pepper off 3½ years old vines at 1½ catt.	2,010
Sale of 267 Piculs Pepper off 4½ years old vines at 3 catt.	4,005
Profit off 10 acres Pepper 4½ years old	758

I have put down $15 per picul as value of Pepper. I have further made no allowance or salary, bungalows, lines, etc., nor for purchase of land and interest, as I fancy, beyond my district, the estimate of expenditure may not be of any great use, owing to cost of labour.

PLANTER.

PEPPER CULTIVATION.

On the foregoing pages is published an excellent article on the cultivation of pepper. But there are some practical difficulties in adopting the system advocated by "A Planter." The first and foremost of them being the selection of posts for the support of the vine. Permanent posts of timber as advocated by "A Planter" will not serve in Ceylon where the attacks of white ants are too notorious to be dealt with in this article. Besides, the expenses of "splitting of permanent posts" will be something enormous, I give below the system of cultivation adopted in Malabar which is pre-eminently the pepper-producing country in the world.

There are two systems prevalent in Malabar, the one, by the ordinary cultivator who owns a small area of ground, and the other, by "gentlemen farmers" who own extensive grounds, and who can command a capital.

To begin with the first:—a red gravelly soil capable of retaining moisture, with a goodly number of mango and jak trees growing on it, is preferred. The mango tree is reckoned the best for the purpose. A mango tree ought to be at least twenty years old before any pepper vines are put on it; for it is believed that a younger tree will produce less fruit when there is vine on it than it would otherwise do. At the commencement of the rainy season, which is the South-West monsoon in Malabar, the soil round the tree is dug, and a small bank, at a cubit distance from the root is formed to confine water. Then from eight to twelve shoots of the vine, according to the size of the tree, are laid down within the bank with three inches of the vine slanting up against the tree. The shoots are about a cubit long. They are then covered with fine mould and earth. As the vines grow they must be tied up to the tree. In the hot season they require watering. At the commencement of the next rainy season, leaves, ashes, dung, etc., must be put near their roots and fresh earth thrown up. The pepper vine begins to bear at five years of age. In four years more it is in full bearing. An ordinary tree will produce 20 lb. of pepper, and a good one 30 lb

The second method *i. e.*, of opening large plantations, is as follows:—A hill-side with an eastern aspect and gentle slope is selected. The land is cleared of its jungle about April, and burnt. The ground is then hoed, and steep slopes are converted into terraces which is very essential to keep the surface soil from being washed off by rain. After a few freshes, just before the regular monsoon begins, hill-rice, dholl, and cotton are sown broadcast. About the middle of June, set in plantain trees at a distance of 8 feet apart, and plant *Erythrina* branches at a distance of about 15 feet apart, or, say at the rate of 200 trees to an acre. Sometimes 300 trees are also planted) but it is believed that pepper vines would not bear well when planted close together. The *Erythrina* branches should be from 6 to 12 feet long. During summer these trees must be watered, if they have not taken sufficient hold in the soil to take care of themselves. When the monsoon has fully set in, preparations should commence for regular planting of the vine. There are two ways adopted by the planters. Some people take six or seven cuttings, each a cubit in length, and put them in a basket with their upper end sloping towards the tree. The basket is then filled with earth, and buried in the ground at the foot of the tree. Between the middle of October and the beginning of November the earth round the basket is dug; and, as a manure, dry leaves, grass, and cow-dung are put round the vines. Some people plant the cuttings without any basket. It has been found by experience that the "basket system" prevents many accidents to which the young shoots are liable. Between October and November the vines must be manured, and tied up to the tree until they are six feet high, after which they are able to support themselves. After the third year the plantations are dug up; and twice a year, at the beginning of the S.-W. and N.-E. monsoon the whole plantations must be hoed, and dried leaves and grasses put as manure. In four or five years the vines begin to bear pepper, in the sixth year they yield a full crop, and continue to do so for sixteen or twenty years, when the *Erythrina* dies, and must be replaced by a new branch and new vines. The pepper vine is liable to be killed by droughts, especially when the N.-E. monsoon fails. Attacks by grubs and insects are seldom heard of in Malabar; between May and June the vines flower, and by January the fruit is fit for gathering. There is only one harvest in Malabar. The men who collect the crop go up by ladders, and with their fingers twist off the *amenta*. The fruit is collected in baskets, and after placing them on the ground, rubbed with the feet to separate the berries. Pepper is dried on mats, or, on a piece of ground purposely made smooth by washing with cow-dung and clay. For three days they are spread out to the sun, but every night are gathered and taken into the house. It is believed that the drying on mats is by far the best manner. A man can daily pick, according to the abundance of the crops from 20 to 30 lb. The rubbing and drying is generally performed by women and children. It is estimated that the expenses of harvest curing, etc., cannot possibly exceed one-twelfth of the value of pepper. The vines, on an *Erythrina* tree, six or eight years old, will yield from 5 to 10 lb. of pepper. Attempts have been made, with complete success, to grow vines against every tree found growing in forests where a moist soil is met with.—MALABARICUS,—Local "Independent."

PEPPER CULTIVATION IN CEYLON: SUCCESS OF THE MALABAR VINES.

We are glad to see Mr. Martin mentioning the jak in the forefront of trees good as supports for pepper vines. This tree, the value of which European planters do not properly appreciate, or so many would not have been in recent years destroyed, is *the* support for native pepper in Ceylon, and both supporting tree and climbing vine seem to thrive simultaneously. Should the vines wear out and there should be no desire to renew them, the tree is valuable as a fruit bearer and ultimately as one of the very best timbers which can be used for furniture, or for house or boat building. We do not see how the system described by Mr. Watson as pursued in the Straits of Malacca, of putting down large numbers of timber posts to support the vines, can pay. In our own case, we find that the pepper vines do well on the sides and over the tops of rocks and boulders, and thus grown amongst tea, there is no necessity for the presence amidst the tea of supporting trees to the detriment of the staple plant.

PEPPER-GROWING IN THE AMBALANGODA DISTRICT.

To the Editor of the "Ceylon Observer."

Eden Estate, Ambalangoda, Jan. 10th, 1889.

DEAR SIR,—I send you herewith a few cuttings from the pepper vines growing on this estate, to show what can be done in growing pepper of the right variety in Ceylon. The pepper on this estate was started from cuttings brought from the Malabar Coast, and, although in some of our importations only ten cuttings out of ten thousand reached the island alive, we have now a magnificent cover of pepper as fine as the best grown in any part of the Malabar Coast. This is without doubt the only successful and satisfactory attempt to grow this spice here. As support for the vines the jak tree has proved our best ally, while the goraka, which is also growing plentifully here, will be the next valuable aid. Other trees such as godapara, diyapara, mililla, are also being utilized.

We started the cultivation of pepper on this estate by clearing all the small jungle, leaving the larger trees including the above-mentioned for support. The vine cuttings, after many importations from the Coast, several of the shipments being total failures, were planted three to a tree; and the result is now a luxuriant growth, of which the cuttings herewith are ordinary specimens.

More jak has been planted, and on these which are making excellent progress the young vines thrive remarkably, well growing up together with the supporting trees. Success being now assured, large nurseries were laid down, and we are now about to plant on a large scale. I trust the specimens of a product which may become of importance in many of other parts of the island as well as here will interest you.

The above information I contribute in continuation of the notice which pepper has already attracted in the columns of the local papers; and if I can give any further information to intending cultivators, I shall be glad.—Yours faithfully,

J. MARTIN.

PEPPER GROWING.

To the Editor of the "Ceylon Observer."

Liskilleen, Neboda, 15th Jan.

DEAR SIR,—I was glad to read Mr. Martin's interesting letter on pepper. During my visit to Perak and Province Wellesley I visited several pepper gardens cultivated by

Achinese who had left their country on account of the war, and had obtained free grants of land from the Straits Government.

They grow their vines on the dadap tree planted about 8 to 10 feet apart.

This tree stands any amount of hacking, and they can therefore regulate the shading. This tree grows all about this district, and is used by the Sinhalese for fencing their gardens. It is very easily propagated from seed or cuttings. This may prove useful to some of your readers. I tried very hard to buy good [pepper] cuttings from the Achinese, but they would not sell at any price. They offered any amount of runners; these seem to keep on growing in a single shoot and won't bear.

They do not manure their vines; the reason they give is they run all leaf.—Yours faithfully.

PRIOR S. PALMER.

ON THE PEPPER CULTIVATION.

(From Royle's Productive Resources of India.)

With regard to the Pepper Cultivation, we have seen that complete success was not attained; in fact, as far as a profitable culture was concerned, the Pepper Plantation at Samulcottah was a failure. Everything, however, appeared favourable, for the Pepper of the Hills was pronounced by dealers to be of excellent quality; the Garden was established close to where the plant was indigenous; and Dr. Roxburgh was a most careful and at the same time skilful Superintendent; but at that time, never having seen the true Pepper plant, he mistook for it a nearly allied species, yielding excellent Pepper, but which for the reasons stated was more difficult of culture. Dr. Heyne, however, (v. infra), has given a different reason for the want of success in the culture. He succeeded Dr. Roxburgh in the charge of the Pepper Plantations, and, having afterwards an opportunity of visiting Bencoolen, he made particular inquiries respecting the culture of Pepper in Sumatra. He learnt that the Malays plant the Pepper vine at distances of five cubits in every direction, and support it on pieces of the Mootchy tree (Erythrinæ, sp.); that the Pepper grew luxuriantly where it had much moisture, and hence the valleys were the most favourable situations for Pepper gardens. After the first planting in September the vine required but little attention, being left to its fate for twelve or eighteen months, when it received a peculiar treatment, which, Dr. Heyne thinks, is the cause of its great fertility. The whole plant, with all its branches, being then *buried* in such a way "that only a small arch of the stem remains above ground." From this arch new shoots soon sprout out, three or four of which are allowed to climb up the prop tree, and are expected to produce flowers and fruit in a year after this operation. Dr. Heyne supposes that by this practice the strength and vigour of the plant,—by the multiplication of its organs of nourishment, the roots—being so much increased, it cannot only produce large crops of flowers, but bring the fruit also to its greatest perfection. The omission of this practice, Dr. Heyne supposes, was the cause of failure at Samulcottah, as he says, "the plants that were raised from cuttings seemed indeed to thrive well, and soon produced blossoms; but such as had made flowers only. To account for this circumstance, we supposed that the hermaphrodite plant had been withheld by the people who sent us cuttings from their hills, where pepper is cultivated to a small extent, when, in fact, we had *starved our plants into celibacy*. (Tracts, p. 402.) It would be an interesting and very useful experiment, as well as one easily put into execution, in any of the Botanic or Horticultural Gardens favourably situated in India, to ascertain whether the Malayan treatment applied to the Pepper Vine of the Northern Circars would make it more fruitful.

PEPPER, which is an old acquaintance, is in the running to be a new favourite. When you have the proper tree to grow it on, it does not give much trouble, and is an admirable auxiliary in a cacao garden or anywhere else where shade is needed. I don't know if R15 a bushel is a big figure or not for such a spice, but I have heard of a first crop having been disposed of at that figure in the Central Province, and the grower is perfectly satisfied. Those who intend to cultivate it, and who think of starting with seed, should know that beginning at that end means five years to wait for returns, whereas by cuttings three years is the time. There is also a great deal in the tree on which it is grown, and those who have a right to speak with authority say, let the tree be deciduous. Nothing better than dadap, which loses much its leaves in the hot weather, and exposes the vine to the tropical winter. Then when the monsoon rains come in there is a fine rush of blossom, and a good crop. On the jak, pepper does well, but for want of the wintering is too apt to run into leaf.* Like most plants in Ceylon it responds wonderfully to manure, and repays the outlay thereon in a speedy and handsome way. Keeping the vine down to eight feet, makes the gathering of the spice simple and easy.

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* Does that apply so much to the lowcountry, as to altitudes varying from 1,000 to 2,500 feet?—ED,

CULTIVATION OF PEPPER AT 1,400 FEET ALTITUDE IN CEYLON.

(*By a Practical Ceylon Planter.*)

AS GROWN AT CRYSTAL HILL—VILLAGE CUTTINGS—MORTALITY IN DRY WEATHER—BEWARE WILD PEPPER—DIFFICULTY OF A NURSERY—A CUTTING DEFINED—NATIVE STYLE OF PLANTING—ADVANTAGE OF ROOTED CUTTINGS—THOSE WITH NO ROOTS KEPT 12 MONTHS IN THE NURSERY—DIFFERENT CONDITIONS OF GROWTH NOTHING TO DO WITH SO-CALLED VARIETIES—POOR SOIL—VINES ON DECIDUOUS TREES—DEAD PLANTS SHOOTING UP AGAIN—ITS SECRET—PLANTS FROM CUTTINGS AND FROM SEED—BRANCH CUTTINGS SHORT LIVED—PRUNING NOT SUITABLE TO CEYLON—TRAINING UP THE TREE—VINES ON FRUIT TREES DAMAGED BY COOLIES—PEPPER AT HALOYA 2,000 FEET ELEVATION—CUTTINGS FROM NEGOMBO—ANOTHER SECRET REVEALED—EXPOSURE TO THE MORNING SUN AND SHELTER FROM AFTERNOON—PEPPER AT COTTA 100 FEET ELEVATION—BATTICALOA—TENDENCY OF THE PLANT TO GROW TOWARD THE EAST—CHANGE OF SEED NOT NEW VARIETIES—DEGENERATION OF NATIVE SPECIES TO IMPROVE BY A STRANGER—MALABAR VARIETY NOT STRONG AS NATIVE—LONG PEPPER.

Matale East, the district of my residence since 1879, I always thought to be about the best for the cultivation of pepper, seeing how freely it grew in the villages round about; but I could not make a beginning till 1884 when the management of Crystal Hill estate was handed over to me. Before my time pepper had been planted on the place by the proprietor, Mr. A. G. K. Borron, and by my time many of the vines were in full bearing. These were all under shade trees among the cacao; and encouraged by the progress they had made, it was resolved to plant pepper under all other trees, especially arecanuts with which we had about 30 acres planted to 10×10 feet and 6 to 8 years old. The S.-W. monsoon was then just setting in and a start had to be made at once. This gave us no time to consider about raising plants in a nursery; in fact, we attached no importance to such considerations as cuttings from old vines were supposed to be all that was required and these could have been got in any quantity from the immediate neighbourhood. Accordingly as was the custom in the country (a practice evidently introduced by some planters) coolies were sent to purchase cuttings. These were usually 18 inches in length and cost from R5 to R10 per 1,000; and anything that came to hand in the shape of a pepper cutting was readily dibbled into the ground. About 20,000 plants were put out in this manner and the weather being all that could be desired, these were all of course expected to grow up satisfactorily. About a month elapsed and we were still being favoured with occasional showers; but what was my disappointment to find, after all that trouble and expense, about 50 % of my plants completely destroyed—some rotted and some dried—and even out of those that were still keeping fresh only a few growing. A week or so after this, the weather had changed to a series of dry hot days, and fancy the magnitude of my horror when I beheld day after day that even those that were growing succumb to what we thought to be the effect of the rays of the sun. As the only remedy to save even those that were still remaining, resort was at once had to shading the plants with leaves. To a certain extent this proved to be successful. But notwithstanding all that shade and constant looking after, I made out about 80 % of my plants to have failed before the next rainy season had set in.

It is not necessary to dwell on the various theories that had been advanced to account for the failures of our first attempt as the facts connected with our second attempt to supply those failures will show what they were.

Long before the N.-E. monsoon set in arrangements were made to get cuttings and have them kept in a nursery so as to be in readiness for planting out with the first rains. Nursery beds were prepared where water was easily accessible and cuttings obtained from the villages as before. But in obtaining these cuttings this time I had to be more cautious, for I found only when it was too late that a good many of the plants of my first planting were of a kind what we call wild pepper which used to grow in the jungles. The best method of detecting these whenever an attempt is made to palm them off as genuine, is to compare the leaves of both species: the leaf of the wild one somewhat pubescent, while the other is glossy. By this means the best cuttings were collected, but a difficulty arose when they were to be put in the nursery: Which is the best way to place the cuttings in the bed? No one could say exactly, but still the differences of opinions on the subject were many. The inexhaustible *Tropical Agriculturist* which I consulted first could not help me at all. My native neighbours could tell me only how they planted a vine long ago, but did not know how to raise a nursery as they never heard of one. At last commonsense had to be relied upon, and one of our theories was (1) that, as they grew from every joint, the longer cuttings should be bent into a bow and both ends buried in the ground at least 6 inches deep; another (2) was to bury the middle of the cutting and have both ends jutting out a few inches above the ground; (3) cuttings which were shorter than 12 inches were put about three inches apart in the ordinary way six inches deep. All the beds were shaded with branches of trees except one bed which was sown with seeds, and were watered as was found to be necessary. But, alas, what was the result? When the time came for planting them out, hardly one-half of the cuttings were alive! Theory No. 1 was a complete failure, No. 2 partly so, but No. 3 so far a success, at least not so disappointing. On the whole, as the saying is, after many failures comes success, I was not discouraged by the failure of this experiment, for herein I conceived the idea how to raise a pepper nursery with any description of cutting successfully. Here I must remark that by whomsoever the system had been introduced, a great blunder had been committed in regard to the manner pepper cuttings are bought and sold now-a-days. As the branch cuttings when grown do not prove to be good climbers but rather inclined to grow into a bush for some time and then die off, the cuttings from the root, or shoots growing out from the parent vine and creep on the ground are always preferred for raising plants. These shoots are usually several yards in length with roots hanging down from almost every joint. The native style of planting was to pull out the whole of one of these shoots and bury it round a tree in two or three coils; they must therefore count each shoot as a plant. But according to the rule in vogue at present, a shoot will be cut into a dozen lengths and sold as a dozen plants. It does not concern us as to whether it is the practice in India or in the Straits Settlements: we should adhere to the rule which was in force here from time immemorial.

But to return to my cultivation. As might be expected we planted out all the surviving plants and made up the difference for supplying our failures by buying fresh lots of cuttings from the villages, but this time I insisted on getting and planting only the cuttings that had plenty of roots in them, as I found these to grow better than those without roots. The cuttings that came without roots, I cut into pieces of 9 inches in length so as to have three or more joints in each piece, and put them into a nursery over which I had a thatched roof, 6 feet high, so as to prevent the rays of the sun falling on its beds, but which at the same time gave it plenty of airy room and plenty of light. I felt that these two conditions were absolutely necessary for raising pepper plants in a nursery either from seed or cutting. These plants I expected to leave in the nursery for at least 6 months before the next planting season. I am now of opinion that to leave them in the nursery for a whole year, 6 months under shade and 6 months exposed to the sun by removing the roof, would be so much the better for them as the sequel will show. The supplying of my first season's failures having been done during the first week of the regular N.-E. rains, the plants I put out from the nursery, as well as the rooted cuttings I so carefully selected and planted, had plenty of time to grow. The rains that year continued from October to January, and so far as my observation went, I found not a single failure for four months among any of my second season's planting. The dry season began in February and the heat was intense in March, and although I took the precaution to have all my plants shaded in good time, the drought at an elevation of 1,400 feet above the mean sea level was too much for even the growing plants to withstand, and consequently a large percentage died out again. It was very strange to observe the different conditions in which the plants that survived the drought had been placed; and when

I compare them with the conditions of those that had succumbed were placed, my bewilderment became still greater. If one were to suppose that sufficient shade would keep a pepper plant alive in any dry weather, here then is an instance to prove the contrary, for I could have counted hundreds of them under trees with abundance of foliage which afforded them the best natural shelter, all dead, while in another more open situation hundreds might be seen to be growing satisfactorily. Here again is an open patch where the best plants had been put out, but now hardly one to be seen; while a few yards farther is a clump of shady trees under whose sombre foliage they are growing like common ferns. This strange anomaly as might be expected led me to the conclusion that there were different varieties of pepper growing in the Island, and that of these some grew under shade and some exposed. If this was the case, surely cuttings can be chosen and planted according to the suitability of each locality. But the theory does not reconcile with the results of my nursery experiments where under a given condition all the plants thrive, till they are removed and planted out: If any of these plants had been of the variety that did not grow under shade there would have been a perceptible number of failures. But such was not the case, and so the failures outside could not be attributed to such a cause. Being then but a beginner as I was, my next impression was that the soil which had been an abandoned field of coffee was old and exhausted, and though some old vines growing thereon were growing luxuriantly and bear good crops, they had been planted when the soil was still fertile and new, but now the plants would not grow as the soil had lost its fertility. But I do not believe in this theory with the experience I have gained up to the present day, as I have reason to believe that pepper could be cultivated in any poor soil provided only the rules necessary to encourage its propensities be strictly observed: that is to say, we must allow the plant to grow as it will, when it will grow as we want.

Since beginning the cultivation I had two seasons for planting, both of which were taken advantage of as already stated. The survivors of the first season were now 12 months old, while those of the second were 6 months. The scarcity of rain still continued and by about the middle of April the drought had done its worst. What with soil, climate and elevation, here was the saddest picture to behold! So much money and labour absorbed and not a single plant of either the first or the second season to be seen alive! All hopes blasted and gone! Even the older vines that looked so lovely with their rich foliage and a promising crop were now quite bare and looked as if they were about to go off. This afforded me an opportunity to observe the influence which the trees on which the vines grew exercised over the vines. Those that grew on any deciduous trees as the Inga Saman, dadap or erabodda, kapok, etc., were the worst for it; while those which grew on jak, arecanut, kekuna, and such other trees which were not deciduous, were still holding on. Even these latter would doubtless have passed off like their companions of the vegetable world, but for the timely rains of the month of May and once more the drooping hearts of the poor Matale planters were cheered? June followed with more rain, and the ravages of the drought were to a considerable extent repaired. And it was then that I found out the advantage of having a plethora of roots in the pepper cutting or plants, before it is planted out and allowed to take care of itself; for wherever this had been the case I found the plant which was given up for dead during the drought, immediately after the rains spring up in beautiful suckers and those that sprang up in this manner were not a few, but thousands. Here then is one of the secrets of the pepper plant—if cuttings without roots are planted out, they die immediately, those with a little root hold on for some time, and rot in the ground, but those with more root grow during the rains, and though a drought may follow and destroy all that is of the plant above, they keep alive under the surface, and spring up again. The advantage of planting well-rooted plants will now be quite obvious; and to get plants of this description as I have said before, it would be necessary to allow them to remain in the nursery for 12 months, treated in the same way as we did with cinchona under thatched roofs. These hints apply only to plants raised from cuttings. Where plants have been raised from seed (sown when fresh and ripe 5 or 6 inches apart) they should be kept in the nursery for at least 18 months, and then put out. I do not think there is any difference in longevity between plants raised from seed and plants from cuttings, and neither do I believe as to there being any difference in their fecundity or crop-producing powers. In fact, from thousands of old vines now flourishing in the district I cannot get anyone to point out which one has been grown from a cutting and which from a seed. It is said that seed plants take longer to bear; but I have not yet found an example, and neither an authority for supposing that it is true. I have already mentioned that branch cuttings are not much sought after for raising plants as they do not grow up the tree as a climber, but rather grow into a bush and soon die off. I have some plants of this description now four years old with a few bunches of crop on each. One of these is just beginning to throw out shoots which are all climbing up an arecanut palm! So it would appear that after a time branch cuttings do grow up a tree. But, from this would again appear that its power of producing foliage and gaining new roots is really very slow, and that this is the cause of its short existence. The slightest drought deprives it of its nourishment owing to the paucity of its feeding roots. I do not therefore think that it is quite safe to try the experiment of growing pepper gooseberry fashion into small bushes by plants raised from branch cuttings, as has been suggested by some correspondents in the local newspapers recently. Hitherto it was thought sufficient simply to dibble the ground with a fork and put in a cutting. But since it is of paramount importance to afford the plant every facility for the development of its roots with the shortest space of time, I think the holes should be made large and freed from stones and other roots. For putting 12 months' old nursery plants the holes should be at least 9 × 12 inches. When planting out care will have to be taken not to allow the roots to bend upward; it would therefore be more advisable not to pull out the plant from the nursery with a ball of earth, but rather to thoroughly loosen the bed and then pick up the plants one by one doing as little injury to the small rootlets as possible and avoiding all chances of crushing or breaking the tender leaf-bud of the growing shoot.

The preceding remarks whether or not of practical interest to those who are about to embark in the cultivation of pepper under circumstances similar to those in which I was placed, refer only to experiences gained during a period of two successive planting seasons; and it must be mentioned that were I to enter into the details of going over more ground, as the cultivation was extended during several seasons, it would be simply repeating the same story again. But it would be expected from me to place on record any observations I may have made during my progress for the last five years; but in this I fear I would only qualify myself very poorly. Two years back when my oldest plant may be said to have been three years of age, and was only from 12 to 18 inches from the ground, where it happened to creep in a single shoot over an arecanut or a jak tree, or where it was spreading on the ground in several shoots round the trees, it was supposed that a top dressing or pruning would induce it to throw out more shoots and grow more vigorously, and this was accordingly done over a small area. But it may be remarked that the experiment was not a success; for about 12 months after when I expected to see them greatly improved, they were no better than they were before. It is therefore conclusive that the system is unsuitable to this climate. Instead of pruning, I have so found out that it is a greater help to the plant to train it up the tree by tying it with some bark of trees or soft strings as soon as the plants begin to grow, and great care should be taken to leave them unmolested till they have thrown out tendrils and taken hold of the tree. But there are great drawbacks to this being achieved. Jak trees bear fruit and the coolies are apt to climb upon them to pick, and thereby trample or otherwise injure the vine by breaking the shoots which retard its growth materially. Those growing on arecanut trees also share the same fate; it is however not the case with vines growing on other jungle trees. I have already stated that pepper can be grown on any poor soil, and will now go a step further and add that it can also be grown in any kind of climate within the tropics. When my oldest plants were four years (an age at which pepper usually begins to crop) the bulk of them were only from two to three feet from the ground, while the others had grown up from ten to fifteen feet high. At first it was supposed that the latter grew on richer soil than the former; but having found some of them to be growing on comparatively poor soil as well, the secret of their success still remained a mystery. Just about this time there appeared a notice in the local papers advertising pepper plants for sale at Lower Haloya estate near Peradeniya, the property of

Mr. R. J. Farquharson, and it being desirable to try a change of cuttings, as agriculturists always try a change of seed, I visited that place about twenty months ago, and endeavoured to obtain some cuttings from some of the best pepper vines that I have seen growing in the Central Province. These I have now in a nursery which of itself is a thing of beauty to see. What impressed my mind most at Haloya was to see the ground shoots of the vines growing on rocks and bearing crop; and then the parent vines which were twelve months old would beat any of 8 years of age in Matale. With an elevation of 2,000 feet, the climate more moist, the pepper seems to have here just what it wants. But when Mr. Farquharson told me that he got his cuttings originally from Negombo in the Western Province, I had to look more about me to know the secrets of his success. I must therefore leave climate and elevation aside and look elsewhere for its cause; and I think I have got it—a secret which is very little thought of in this country, although the greatest importance is attached to it by cultivators in the Straits Settlements and countries about it. For growing pepper the Chinese and Malays always select a piece of land which faces the east and is sheltered from the west. If there was any virtue in this selection, it must be, I suspect, that the morning sun is more essential to the plant than the hot afternoons. The situation of Haloya favours this idea; and when I say that most of the best growing plants on Crystal Hill are also to be found in situations facing the east, it would appear that there is some truth in the theory. On a recent visit to Cotta near Colombo I was greatly interested with a pepper vine shown to me in his garden by Mr. John Garth, which was then only 18 months old, but in height 10 feet from the ground with a fair promise of crop. The climate of Cotta with an elevation of perhaps 100 feet above the mean sea level, is, I think, more moist than it is in Matale, and its proximity to the sea in the west which is only five miles distant, always brings to it the frequent showers of rain which arise from the sea, but which as they reach higher regions is dispersed and carried away by different currents of wind. The soil of Cotta is the same as what may be seen in all parts of Colombo—cabook and red clay, and as Mr. Garth's property must have been cleared and planted with coconuts more than fifteen years ago, I should think the best of its good qualities must by this time have been exhausted; and I cannot therefore admit that any special richness of the soil, combined with its more favourable rainfall to be the cause of the wonderful growth of the vine I had seen with hardly any attention paid to it, than the full exposure of the field where it grew to the morning sun, and its protection from the heat of the rest of the day. Now compare these facts with what has been said of pepper grown successfully at one time in Batticaloa in the Eastern Province, and the conclusion will be irresistible that it was chiefly due to its exposure to the east and shelter from the west. By advancing this theory of an "eastern situation"

I do not mean to say that pepper would not grow in any other aspect of land, for I have seen vines growing without any trouble at all in diverse positions in native villages as well as in cultivated estates. But even then these are only few and far between and should be considered as exceptions. But then these exceptions will not fail to strike even a casual observer as to there being a certain tendency in the smallest plant as well as in the largest vine to incline all its growing powers to a point from whence it gets the most light, and a further glance will show that this light which exercises such a great influence over it, is not of the afternoon, but of the morning. The best specimen of a vine might be seen to be growing over a half decayed jak tree which is fully exposed to the sun blazing from the west; but if one would only examine as to which was the side it had originally struck root, creeped along its support and covered itself with the richest foliage, it would invariably be seen that all this was done from the first of the four cardinal points. Now having said this much to the point under discussion, I arrive at the conclusion that where the plant is not afforded natural shelter, it would be always of some advantage to provide artificial shade from the side it gets the afternoon sun. This could always be obtained by putting out the plant always to the eastern side of the tree on which it is intended to grow, but where it could not be had other remedies will have to be adopted.

Unlike some other products of agriculture, I think, we must pay more attention to *change of seed* in pepper cultivation than to anything else. This should not be understood as if I am recommending the adoption of any distinct variety of pepper; in fact I do not believe that even where one could be distinguished from the other, any one variety would grow and bear better than another. If, however, any of my brother planters prefer the "Malabar variety," bought at such exorbitant prices as those recently advertised in the local newspapers, over what could be obtained in the country, they would do well to first see what has been the result of similar experiments with other products and satisfied that the money thus given away would be returned by larger crops, than the native indigenous variety is capable of producing. In my humble opinion any variety would grow in this country only if it could be made to grow and, be it exotic or indigenous, under careful cultivation it would bear crops as good as those of any other parts of the world. It should also be carefully noted that cuttings, plants or seeds for planting should always be procured from a district whose elevation is either higher or lower than that of the district in which it is intended to be planted. There is also another point which should not be lost sight of. History tells us that pepper was an item of fiscal revenue of the island more than four hundred years ago; and if we only consider the length of time the indigenous variety had been growing, multiplying its species up to this day throughout the island, the fact must be patent to every one, that by this time it must have greatly degenerated, and that it does not produce so much crop now as it did before. This is supposed to be also the case with paddy and other grains which in former times turned out from the same extent of land from sixty to seventy fold more crop than they do at the present day. With regard to the latter product we know that several attempts had been made to introduce seed paddy from foreign countries: but the results obtained when compared with those of the native sort, there was hardly any encouraging difference to be found. I think it was the same with coffee. Now all these facts tend to show that it is very unlikely that any foreign variety of pepper would ever supersede the native product; but at the same time I am inclined to believe in the theory that the introduction of a more robust stranger into the existing native family, would improve the blood and give new vigour to the latter; and on that consideration only would I recommend any of the so-called new varieties of pepper, but not as producers of larger crops in which I do not believe. At the Agri-Horticultural Show in Kegalla last year I saw some peppercorns of the Malabar variety exhibited—each grain about the size of a seed of the *Jalapa Merabilles* (4 o'clock flower). To the taste it was not so strong as our puny little native grain. The Indian variety of the Long Pepper (Tippily) also produce beans three or four times larger than those produced by our native creeper; but for medicinal purposes the latter is more sought after than the former.

In conclusion I must apologise for the disconnected style in which this essay is presented to the readers of "All About Pepper." A planter who is occupied with his work from the gray morn to the dewy eve can hardly be expected to give much time to writing—may therefore some indulgence be allowed him not as a privilege but as his right!

A. VAN STARREX.

PEPPER CULTURE IN CEYLON; REMARKS ON MR. VAN STARREX'S PAPER.

An experienced low-country planter remarks on Mr. Van Starrex's paper as follows:—"The record of his experiments and failures is interesting and amusing enough, but might have been condensed greatly. A *resume* stating shortly how he would recommend that pepper should be grown would have been useful and might have been somewhat as follows:—'To sum up. Do not plant unrooted cuttings *in situ*; a very large proportion fails. Raise cuttings in nurseries, the cuttings to be say a foot long and from the stem (branch cuttings useless), six inches to be buried; shade and water according to circumstances; allow the plants to remain in the nurseries a year before transplanting; harden off by gradually removing shade. In suitable weather remove carefully without earth to the roots, but taking care not to injure those. Plant in holes at least a foot wide by nine inches deep, and when the vines begin to creep, train them till they adhere to the stem of the tree. For supports select trees that are not deciduous. Plants raised from seed should be allowed to remain in the nursery till they are 18 months old. For planting, by preference, select localities with an eastern aspect, as observation teaches that the vines grow and crop best in such situations. The ordinary native pepper is well suited to Ceylon and is a good bearer. Before adopting largely any new varieties recommended, ascertain whether they have been proved a success, and are known to possess qualities better than our country variety. In raising nurseries of either cuttings or seed, do not use those to be procured in your own district, but get them from some other district, at either a higher or lowere levation. By attending to this the resultant vines will be strong and good croppers.'

"This I take to be the pith of Mr. Van Starrex's essay, and upon the whole the advice given is good.

"My own experience of planting pepper cuttings at the roots of the trees where they are intended to grow is not so unfortunate as his. I usually succeed in getting 60 to 70 per cent. to grow and thrive. Planting *in situ* where successful gives an advantage in time of quite 6 months if not more, as in transplanting from nurseries all growth, with the exception of a few inches, has to be cut away. Where time is no object certainly raising plants in nurseries is the preferable and safest plan, as plantings out are sure to be more successful even in unfavourable weather. Where unrooted cuttings are planted out in the spot where they are intended to grow, two should be planted in each hole, the cuttings being 18 inches long, 12 inches of which are buried, and the soil *very firmly* trodden round them: if weather should turn dry, shade with leaves or branches."

PEPPER.

(From "Tea Planting in Ceylon," by "Eastward-Ho.")

If you have a rich soil and a moist and warm climate (the moister and hotter the better) a more paying cultivation, and one likely to continue so in the face of any extensions that can be attempted, 'does not exist, and returns may be expected in the 3rd to 4th year or about as soon as from Coffee or Tea. The two chief sources of supply are the Straits Settlements and the Malabar Coast. In the former "John Chinaman" holds a monopoly of the industry, and one I fancy it is useless for outsiders to attempt to break through there, for he has ways and means of his own of making another man's estate "not profitable"; but though it has been ascertained that the actual annual returns amount to £80 to £100 per acre owing, to custom, and the Chinese system of loans, the crop passes through so many different hands—each employing his broker—that by the time it comes to the merchant for shipment the unfortunate cultivator finds himself the smallest gainer of all. But as profits accumulate, he in turn becomes lender; and so it goes on, each smiling a bland smile. Their system of cultivation is to grow in rows (7 × 7) against split posts about 6 inches in diameter, and 10 feet high, in the open, great care being taken to make the vines spread out thick at the base and gradually taper upwards, assuming the form of a pyramid. The vines average annually (two crops) about 5 lb. of cured pepper on a well-kept garden. On the Malabar Coast the system of cultivation differs; it being usual to grow against trees with branching heads kept freed of a certain portion of their foliage. The returns I cannot exactly state; but not less than at the Straits! In Ceylon though several species of pepper are indigenous and two or more varieties may be said to be semi-cultivated by the natives—that is to say they stick in a cutting against a Jak tree, and if it grows, in due course collect the produce—it is only within the last two years the industry can be said to have attracted the attention of planters. The first among us to attempt it was Mr. T. S. Dobree, after a visit to the Straits to satisfy himself as to probable profits, and ascertain in detail the Chinese system of cultivation. His attempts have been confined to Udagama, and there is now in the district a considerable acreage, on a number of estates, planted up with pepper; the only deviation from the Straits' system being the substitution of imbool (cotton tree) or Jak plants (to be kept dwarfed) in place of posts, as the latter have been found subject to the attack of white ants, and in consequence not sufficiently permanent.

There are several cultivated varieties, evidently, of the pepper vine, as Dr. Trimen, the Director of the Ceylon Botanical Gardens, has noted the Straits species to differ from any kind grown here, and that this must hold good as regards the Indian coast would seem equally evident, for there is a property (though why only one I do not know) there, that whilst the best white and very carefully ripened and cured pepper from the Straits fetches only 1s. per lb., its produce is quoted regularly at as high as 2s. 6d. per lb. A fabulous difference! I believe myself, by permitting shade, the vines should be found to yield profusely in certain parts of North Queensland. The cultivation, no doubt, will receive attention largely in Borneo later on amongst both Europeans and Chinese, as good (and useful) friend John I don't think will be allowed to have quite his own way there: though as the chief source of the labor supply, he will hardly ever make it as peaceful a "planter's refuge" as Ceylon. Plants can be raised readily from seed, which should be sown in shaded beds composed of rich compost, and regularly watered in dry weather. They should be allowed to remain in the nursery till a foot or so long. If cuttings are used they ought not to be less than 2 feet. In either case two at least should be planted at each post or tree. After having grown some length the vine should be turned down and buried in a shallow trench around the support, 5 to 6 inches only of the tip showing above ground, being careful to cover lightly with rich, soft loam and that the work be done in the wet season. The object of the above is to secure a stronger *root growth*, new shoots and roots striking out from the buried segment; but I am convinced that if not actually killed, the plant often is much weakened and its growth checked (probably equivalent to the loss of a season) either by being buried too deep; not enough at the tip left uncovered; stiff earth laid on; or if the work be done out of season. Pepper growing, in the first instance, requires a little practical understanding, to be fully successful, and a good deal of after care and attention. Burnt earth is said to be the best manure; its value though much depends of course on the chemical properties of the raw material. Thanks are due to Mr. Dobree for the letter appended.

MR. DOBREE'S NOTES ON PEPPER CULTIVATION.

Line 7×7 feet; choose flat or slightly undulating land. If at all steep land is used, it should be *terraced* at once. Cut holes 2 feet square by 15 inches deep, and fill in with good soil free from all stones and roots. Don't heap up the earth when filling in the hole, but rather leave a hollow to catch all moisture. At the lower corner of the hole put in a post of split wood 12 feet long by 10 feet out of ground and about 8×8 inches square. This post must be of good hard wood, and have the end that goes into the ground cleaned and tarred. The vines at Singapore last for 20 or 30 years. I saw a garden said to be 30 years old, still bearing well, and the posts that had never been renewed were still standing.

These posts are the most expensive* part of pepper planting, and I doubt, from what I know and what I have seen, whether they will be suitable for Ceylon, where white-ants are much worse than in the Straits; they no doubt, however, succeed admirably for the purpose in Singapore. When suitable posts cannot be obtained, I advise putting in cuttings 6 feet long of either "imbul" (cotton tree), "suriya," "erabudda," or "hikgas." I was told that the imbul or cotton tree is thought in Java to be the most suitable live tree to grow pepper on, and I find it the best down here. When the shoot from the cotton tree cutting or plant has grown to 10 feet from the ground, it should be topped and always kept as a pollard, both to prevent the pepper vine being shaded, and to keep the vine from running up too high. The cuttings must, of course, be put in in wet weather.

I also tried jak trees, putting in two jak seeds in every pepper hole. I found, however, that the growth of jak trees varies very much: some of my trees grow from seed put in in June 1881 were 5 or 6 feet high in December 1881, others were 1½ foot. Monkeys also pull out the jak plants, and crickets nip off the tops. I therefore consider cuttings of the cotton are better, especially as they give something for the pepper vine to get hold of at once. Cotton tree plants can be used, and are easily raised from seed. When planting, put three cuttings or two good plants in each hole: both cuttings and plants should be 18 inches long when planted out. If plants are used, put their root end as far from the post as the hole will allow, and bury all the plant except the head and about 4 inches: this will cause the plant to throw out roots from all buried points and increase its powers of absorbing manure. As the plant grows, keep it buried till it reaches the post or cutting it is to grow up.

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* From R70 to R150 per acre—889 posts per acre.

Plant the cutting or plants about 6 inches deep and shade *well* with fern—or some suitable and cheap substitute.

The Chinese make a small mound round each vine, but I think in Ceylon, where we have heavier downpours of rain, it is better to cut small drains 1 mamoty wide and deep between *every* row (the usual 18 inch drains 1 chain apart must also be cut) both up the hill and across, so that every vine shall stand in its own space. The earth from these drains will from a slight mound round the holes, and into the hollow all manure should be put. The Chinese never dig in their manure but just lay it on the surface.

This work need not be done till the clearing is planted.

The Chinese commence manuring (with burnt earth chiefly) directly the cuttings are planted, and manure twice a year when they can afford it; once always. Burnt earth, cattle manure, fish and I think lime and poonac would be the best. In some places, I believe in Sumatra, they let the vine run up to 5 feet, then take it off the post, and bury it in the ground, leaving the arch out of the ground, from which two or three suckers grow, and are trained up the post.

The Chinese in Singapore and Johore, who are said to be the best cultivators of pepper, do not do this, but plant their cuttings as I have described. They always use *cuttings*, and only the ends or tops of branches, which they put in a shaded nursery to roots before planting out. I myself have found *plants* much more certain than cuttings and hardier, but I was not able to obtain cuttings of the ends of branches only. The vines commence to bear at 2½ years old. I saw a garden of this age in Singapore. The vines were about 6 feet up the post but bushy at the bottom, and had a maiden crop on them. I can't estimate how much an acre, but I think it was about 600 lb. per acre.

From a good old average vine—said to be 30 years old—I saw 30 lb. of green pepper taken and weighed. I saw several gardens that I believe *averaged* as much as this vine.

As pepper dries down to one-fifth of its green weight, this would be six lb. of marketable pepper, or at 889 vines per acre 5,334 lb. per acre for the autumn crop, and the Chinese said they got as much more for the spring crop. I did not see any spring crop, so cannot vouch for the truth of this total :- say 10,000 lb. per acre per annum. I don't believe this.

The Chinese never, as far as I saw, plant more than 10 to 15 acres of pepper in one garden along a carefully selected basin, and they cultivate each vine very highly, so that there are no bad vines in the whole acreage, until the garden is old and worn out.

A good average crop of pepper I have been told on reliable authority is about 28 piculs an acre or say 33 cwt., or rather over 4 lb. of prepared pepper per vine. The price of pepper in Singapore now $15 per picul, is very high and I was told that $10 was a safe price to calculate on. This would give 28 piculs at $10=$280, or say about R600 per acre as the value of the crop, and putting down the cultivation at the extremest limit of R200 per acre per annum, leaves a profit of R400 per acre. This sounds almost too good to be true, but I feel certain these profits are made out of the pepper gardens in Singapore and Johore, and there is no doubt that the Chinese have made very large fortunes from this cultivation. The preparation is very simple. The Chinese use a very rough drying drier something like the ordinary Sinhalese lime-kilns with warachies on the top and matting on which the pepper is spread to dry with fire underneath. White pepper is made from the best and upest berries. It is placed in heaps for several days to ferment and then trampled out and washed and dried very much in the same way as coffee. Pepper is sent to England in bags of 142 lb. each. It is taken at 16 cwt. to the ton for black pepper, and 18 cwt. for white. By using winnowing and sizing machines, I am sure we would very much improve on the samples of Singapore black pepper, especially by picking out the grey peppercorns, for which work labour is too dear in Singapore. *One penny* per lb. covers shipping, insurance, loss on weight (which is from 6 to 10 per cent.) brokerage and freight. Pepper damages tea, and some ships refuse it. The lowest price it has ever been down to is $6 per picul many years ago. For the last five years it has averaged from $10 to $15 per picul.

A free, rich soil is the best, and a continually wet climate. A long drought is said to cause the berries to fall off the branch before they are ripe. I could hear of no disease or blight that affected the vines, and certainly saw none on any of the many gardens I visited. The crop is picked with light step-ladders, the branches are picked whole, as soon as some of the berries begin to turn red and yellow. I don't think it possible to get all the berries on a branch ripe before it is picked ; some would fall off before all were ripe. I consider good chena land, if not steep and washed, as better for pepper than virgin forest, unless all the logs and roots of the latter are cleared away, for it is extremely difficult to work up pepper as it should be done with the logs and roots on the ground. The vines that grow over the old *stumps* of large trees are always the finest, as they seem to derive nourishment from the rotting timber.

The 4th year's crop should quite cover expenses, but I cannot state the cost of picking and curing. I believe that for such districts in Ceylon as those round Galle, Avisawella, Yatiyantota, and in fact all the south-west of the island, pepper will be one of the most remunerative products, if care is taken in selecting suitable localities for planting it. All ridges should be left in jungle so as to have plenty of earth available on the spot for using as manure when burnt. The Chinese pepper gardens are all surrounded by forest which, for about 2 chains from the pepper, have the earth for a foot deep at least all carried off during the course of years as manure.

I have forgotten to state that the vines should in no case be allowed to run up to the top of their post or pollard, until they have thickened out below. When the runner is 2 feet high the top should be nipped off to make it throw out laterals, and the vine should always be kept in the form of a sugar-loaf until it has got thick and bushy from the ground to the top of the pollard. If not stopped and made to thicken out, one single runner will get up to the top of the post or pollard in a year or 9 months' time and never become a good bearing vine.

T. S. Dobree.

PEPPER.

(From Dr. Watt's Dictionary of the Economic Products of India.)

Piper Nigrum, Linn. Fl. Br. Ind., V., 90; Wight, Ic., t. 1935.

Syn.—Piper trioicum, *Roxb*; P. nigrum, *var.* trioicum, *Cas. DC.*; P. malabarense and baccatum (the Indian synonyms only), *Cas. DC.*; Muldera multinervis, and Wightiana, *Miq.*

Vern.—*Gulmirch, filfilgird, mirch, kali-mirch, habush, choca mirch*, white form = *safedmirch*, (Hind.); *Vellajung, murichung, kolukung, muricha, kala-morich, gol-morich*, (Beng.); *Spot*, (Bhote); *Martz*, (Kashmir); *Gol-mirich*, (Pb.); *Daru-garm, daur-garm, march*, (Afg.); *Gulmirien*, (Sind); *Miri, kala*-miri, white form = *safed-miri, pandhari-miri*, (Bomb.); *Kali mirch, mire*, (Mar.); *Kalamari, kalo-mirich, miri*, (Guz.); *Choca, kali mirchingay, kali-mirchi*, (Dec.); *Milagu*, (Tam.); *Miryala tige, miriyalu*, (Tel.); *Menasu, kare menasu, moluwkodi, mirialu*, (Kan.); *Lada, kuru mulaka*, (Malay.); *Sa yo mai, nyu-yoke koung, nayukon*, (Burm.): *Gammirris-wil, gam-miris, kalu-miris*, (Sing.); *Maricha, ushana, hapusha*, (Sans.); *Filfiluswad*, (Arab.); *Filfile-siyah, pilpil, filfile-aswad, filfile-gird*, (Pers.).

Habitat.—A climber, which is usually diœcious though the female often bears two anthers, and the male a pistillode. It is found wild in the forests of the Circars, doubtfully indigenous in those of Assam and Malabar, and is cultivated in the hot damp localities of Southern India.

CULTIVATION.—Pepper was one of the earliest articles of Indo-European trade, and has been extensively cultivated on the Western Coast of Southern India for many centuries. Linschoten in 1598 gives perhaps the first detailed account of the method of growing and gathering the spice, stating that "much pepper" was there to be found along the whole coast of Malabar. Though cultivated from remote times in Sumatra, the Straits, Siam, and the Malay Peninsula generally, Malabar has always been considered to produce the best pepper.

MADRAS.—The method of cultivation followed is very simple. Cuttings are put down before the commencement of the rains in June, in rich soil, not subject to excessive accumulation of moisture. Places at the foot of trees which have rough or prickly bark are chosen, such as the jak tree, *Erythrina indica*, the cashew nut, mango tree, and others of a similar description. The vines shoot up, and if allowed, will grow to a height of 20 to 30 feet, but are generally kept down by cutting and pruning. All suckers should be removed, and the ground around should be kept clear of weeds. In three years the vine begins to bear, producing long clusters of 20 to 50 berries abundantly from all its branches. From the third to the seventh year the plant improves, after that time it remains in good condition for three to four years, and then deteriorates for about the same period, until it is no longer worth keeping. It is then cut down and new shoots are planted. The fruit is gathered as soon as the berries at the base of the spike begin to change colour from green to red, since if allowed to ripen fully it becomes less pungent, and easily falls off. The day after they are gathered the berries are separated from the stalk by hand-rubbing, and picked clean. They are then dried by exposure to the sun, or more frequently by the heat of a gentle fire. During this process hand-rubbing is occasionally performed to separate any remaining portions of stalk. "White pepper" is prepared by divesting the ripe berry of its skin by maceration in water, after which it is rubbed and finally bleached in the sun. It is occasionally bleached still further by means of chlorine. It is twice as expensive as black pepper, but is in little demand.

Towards the end of last century Dr. Roxburgh discovered the plant growing wild in the hills north of Samulcottah, and commenced a large plantation in that neighbourhood. In 1789 this garden contained about 40,000 or 50,000 vines occupying about 50 acres of land. Considerable success was attained, about 1,000 vines yielding from 500 to 1,000 lb. of berries. Many of the plants, however, were found to bear only male or female flowers, and the latter if not associated with a hermaphrodite flower on the same ament, were found to produce pepper less pungent than the ordinary spice. The attempt was abandoned in a few years. No recent statistics are available regarding the total yield of the Malabar Coast. Milburn in 1825 estimated it at 30,000 *piculs* (1 *picul* = 133 lb.). Drury estimates the average annual production of the hilly districts of Travancore to be 5,000 candies.

BOMBAY.—The only district in which pepper is grown to any extent in this Presidency is Kanara, in which 1,096 acres were under the crop in 1888-89. The pepper-vine cuttings are planted in August in betel-palm gardens when the trees are thirteen years old. Four cuttings, about 2 feet 3 inches long, are made for every betel-palm. One end of each is set four to six inches deep and the other is trained on to the palm. The vine requires no further care except tying its branches once a year in May. It bears in six or seven years and lives about twenty-five, so that one betel-palm outlives three or four sets of vines. The pepper is picked from ladders in March and April as soon as the berries are full grown but before they are ripe. One man gathers and cures at the most about three pounds a day. The bunches are piled in a heap under shelter and kept for three days. They are then rubbed with the foot, to separate the stalks and all foreign matter, after which the pepper is fit for sale.

Three different forms of vine are recognised, called respectively, *kari malisaru*, *sambar*, and *arsina murtiga*, which differ, not in quality but in yield. Of these the first is the best bearer, each vine yielding as much as 3 pounds a year, but it is not so easy to grow as the others, since it thrives only on strong red soil. The other two grow well in the ordinary light-coloured soil known as *arsina munnu*, but *sambar* yields only about three-fifths of a pound, and *arsina murtiga* one and one-fifth lb. annually. The average yearly yield of each pepper vine, taking all forms into consideration, is said to be about one and one-tenth lb. The acreage outturn averages 280 lb. in a first class, 140 lb. in a second class, and 56 lb. in a third class garden. The selling price is about 3½d. a pound (R4 the *man* of 28 lb.).

In Kanara the vine is not only cultivated, but also grows spontaneously in "pepper forests," or *menasu kans*. These are occasionally tended for the sake of the fruit. The branches of the vines should be stripped of all other climbing plants, all the bushes in the forest should be cut down every third year, and every fifth year the side branches of the trees ought to be lopped, as the vine clings best round straight slender stems. Where the supporting trees are too far apart, a branch or cutting should be planted, and if no pepper vine be near, a shoot or two should be set in the earth near the young tree. When thus cared for a vine is said to live about ten years. When an old vine dies a young shoot must be trained to take its place. Nothing is done besides attending to the training and distribution of the vines. When a tree withers its branches are lopped off, and a circle round the foot is stripped of bark. Under this treatment the dead tree gradually rots, and does not fall, which is necessary since the fall might produce great havoc amongst surrounding vines. The rotten wood also forms a valuable manure for the pepper.

Owing to want of tillage the yield is inferior in quantity and quality to that of pepper grown in gardens, one vine seldom yielding more than half the quantity produced by a garden vine. A man in one day can gather the produce of about twenty trees, or rather more than 12 lb., at the same time training and tying up the plants where necessary *(Kanara Gazetteer, pt. i.i., 10-11)*.

Medicine.- Sanskrit authors describe ***Black Pepper*** as acrid, pungent, hot, dry, carminative, and useful in intermittent fever, hæmorrhoids, and dyspepsia. It is generally prescribed in combination with long pepper and ginger, under the name of *trikatu*, or the three acrids. Dutt states that very few Sanskrit prescriptions are free from these three, which, however, appear frequently to be added without reason, and sometimes only for the sake of rhyme. Externally it is used as a rubefacient in alopecia and skin-diseases *(Mat. Med. Hind.)*. Dymock informs us that Muhammadan writers describe the spice as deobstruent, resolvent, and alexipharmic. It is prescribed by them internally as a nervine tonic, and applied externally in paralytic affections, while in toothache it is used as a mouth wash. It is esteemed as a tonic and digestive, and is believed to be diuretic, emmenagogue, and a good stimulant in cases of bites from venomous reptiles.

In modern Indian medicine the properties assigned to the drug by Sanskrit, Persian, and Arabic writers are still believed in. It is much employed as an aromatic stimulant in cholera, weakness following fevers, vertigo, coma, &c., &c.; as a stomachic in dyspepsia and flatulence; as an antiperiodic in malarial fever, and as an alterative in paraplegia and arthritic diseases. Externally it is valued for its rubefacient properties, and as a local application for relaxed sore-throat, piles, and some skin diseases. According to Dymock abortive pepper-corns, known as *poklimiri*, have long been known and used by the Hindus. Garcia d'Orta notices them under the name of "Canarese Pepper," and observes that they are valued by the Natives as a medicine to purge the brain of phlegm, to relieve toothache, and as a remedy for cholera.

Pepper was one of the earliest spices used in Europe, both as a condiment and medicine. In the fourth century B.C., Theophrastus noticed two kinds of pepper probably the Black Pepper and Long Pepper of modern times. Dioscordies knew pepper to be a production of India and was acquainted with White pepper. Pliny, Arrian, and others also mention it *(Pharmacographia)*. Many writers of the early Middle Ages refer to the spice, all describing it as coming from Male or Malabar. Perhaps the earliest to accurately describe the extent of its cultivation and uses was Linschoten, whose friend and commentator Paludanus enters into a long dissertation on its medicinal virtues: "It warmeth the mawe," he writes, "and consumeth the cold slymenes thereof, to ease the payne in the mawe which proceedeth of rawnesse and winde, it is good to eat fyve pepper cornes everie morning. He that hath a bad or thick sight, let him use pepper cornes, with annis, fennel seed and cloves, for thereby the mystinesse of the eyes which darken the sight is cleared and driven away."

But in modern European medicine it is very little used, being rarely prescribed except indirectly as an ingredient of some compound preparation.

CHEMICAL COMPOSITION.—Pepper contains a resin, a small quantity of fatty oil and an essential oil, to the first of which its sharp pungent taste is due. The essential oil has the odour, but little of the taste, of the spice. The drug yields from 1·6 to 2·2 per cent. of this volatile oil, which agrees with oil of turpentine in composition as well as in specific gravity and boiling point. The most interesting constituent of pepper is *piperin*, of which the spice contains from 2 to 8 per cent. Like morphine it agrees with the formula $C_{17} H_{19} N O_3$, though without alkaline reaction it combines with hydrochloric acid in the presence of mercuric and other metallic chlorides. Anderson, in 1850, resolved *piperin* into *piepric acid*, $C_{12} H_{10} O_4$, and *piperidine*, $C_5 H_{11} N$. The latter is a liquid colourless alkaloid, boiling at 160°C, having the odour of pepper and ammonia, and directly yielding crystallizable salts *(Fluckiger & Hanbury, Pharmacographia)*.

SPECIAL OPINIONS.—§ "Made into infusion and given in colic and cholera" *(Surgeon H. D. Masani, 30th Bo. N. I., Karachi)*. "Stimulant, carminative, antiperiodic; dose 5 to 20 grains: used in intermittent fever, debility,, hæmorrhoids, prolapsus ani, gonorrhœa, and cholera" *(Chunna Lall, Hospital Assistant, Jubbulpore)*. "It is used extensively as an external application to inflammation" *(Civil Surgeon F. McConaghey, M.D., Shajahanpore)*. "A very strong decoction of pepper given in that stage of cholera in which all vomiting and purging cease and the abdomen becomes tympanitic affords great relief" *(Surgeon-Major D. R. Thompson, M.D., C.I.E., Madras)*. "Valuable carminative and stomachic. Highly useful, in indigestion and dyspepsia. Forms a useful ingredient in tooth powder" *(Assistant Surgeon S. C. Bhattacharji, Chanda)*. "Black pepper powder mixed with *ghi* is said to be a useful application in cases of urticaria" *(Surgeon Joseph Parker, M.D., Poona)*. "Used as antiperiodic, also in hæmorrhoids and cholera" *Assistant Surgeon Nehal Sing, Saharanpore)*. "Is a useful application to boils and pimples. It is carminative, antacid, and stomachic, and is used in dyspepsia, diarrhœa, and indigestion" *(Brigade Surgeon F. H. Thornton, B.A., M.B., Monghyr)*. "Aromatic, stimulant, and stomachic. Combined with calumba and bismuth, it is useful in dyspepsia; also with asafœtida and camphor in the flatulency of dyspepsia. Largely used by me in preparation of cholera pills for distribution during epidemic outbreaks of the dsicease" *(Civil Surgeon S. M. Shircore, Murshedabad)*. "Locally it is applied to boils, &c., in the form of a thin paste as a resolvent" *(Assistant Surgeon T.N. Ghose, Meerut)*.

Food.—The use of black and white pepper as condiments is too well known to require any remark in this work.

TRADE: HISTORY.—The trade in Pepper is perhaps the oldest, and during the Middle Ages was certainly much the most important branch of commerce between Europe and the

East. The history of its development from earliest times is well brought out in the interesting and exhaustive account given in the *Pharmacographia*. According to Fluckiger & Hanbury, the learned authors of that work, the spice was well known at least as early as the fourth century B.C. Arrian, the author of *Periplus of the Erythrean Sea*, written about A.D. 618, states that pepper was then imported from Baraké the shipping place of Nelkunda, localities which have been identified with points on the Malabar Coast. During the Middle Ages it was the most esteemed and important of all spices, indeed it formed "the very symbol of the spice trade, to which Venice, Genoa, and the commercial cities of Central Europe were indebted for a large part of their wealth."

Tribute was levied on pepper, the ransom demanded from Rome in 408 A.D., by Alaric, King of the Goths, included 3,000 pounds of pepper, and after the conquest of Cæsarea in 1101 A.D., by the Genoese each soldier received two pounds of pepper as part of his booty. Pepper rents were also not uncommon, by means of which the wealthier classes secured from their tenants a supply of their favourite condiment, at a time when the market was by no means certain.

The earliest reference to a trade in pepper in England is in the statutes of Ethelred, A.D. 978—1016, where it is enacted that traders bringing their ships to Billingsgate should pay at Christmas and Easter, with other tribute, 10 pounds of pepper. The "Pepperers" formed a fraternity mentioned as existing in London in the reign of Henry II., and subsequently became incorporated as the Grocers' Company. The price of the spice during the Middle Ages was always very high, owing to the large tax imposed on it in its passage through Egypt. Thus in England in the thirteenth and fourteenth centuries it averaged 1*s*. per pound, equivalent to about 8*s*. of our present money. This high price, amongst other reasons, incited the Portuguese to seek for a sea-passage to India, after the discovery of which (1498 A.D.) the price fell considerably, and the cultivation was extended to the Western Islands of the Malay Archipelago. The trade then departed from the ports of Central Europe, and became practically a monopoly of Portugal till the eighteenth century (*Fluckiger & Hanbury, Pharmacographia*). During this period of Portuguese supremacy in the trade we find Linschoten writing that the "King of Portingal" contracted with middlemen in each of his "Forts" on the Coast of Malabar for an annual supply of thirty thousand "quintales" of pepper, and bound himself to send five ships every year to export that amount. All risk was held by the middlemen or "farmers," who obtained the price of twelve ducats a quintal for all pepper landed in Portugal. As a compensation for this risk the middlemen had "great and strong privileges: first that no man of what estate or condition so ever he bee, either Portingall, or of any place in India, may deale or trade in pepper, but they, upon paine of death, which is very sharply looked unto." And "although the pepper were for the King's own person, yet must the farmer's pepper be first laden, to whome the Viceroy and other officers and Captaines of India, must give all assistance, helpe and favour with watching the same, and all other things whatsoever that shall by the said farmers be required for the safetie and benefite of the said pepper."

In more recent times the Malabar Coast monopoly in the trade became gradually destroyed. More and more pepper was cultivated in, and exported from, the Malay Archipelago, and localities further east, till, as early as the beginning of this century, we find the Indian trade much smaller in proportion than that of other places. Thus Milburn in 1829 states that the produce of Sumatra was estimated at 168,000 peculs, that of the islands at the mouth of the Straits (Burtang, Linga, etc.) 12,000 peculs, the Malay Peninsula produced 28,000 peculs, the east coast of the Gulf of Siam 60,000 peculs, Borneo 20,000 peculs, and the west coast of India only 30,000 peculs. But he remarks "the pepper of Malabar is esteemed the best."

A review of the present percentage imports into Great Britain shews a still further decrease in the relative importance of India as a source of supply. Thus, in 1872, the imports amounted to 27,576,710 lb., of which the Straits Settlements supplied 25,000,000 lb., and British India only 256,000 lb. In 1889 the total imports from the British East Indies (including the Straits Settlements, Ceylon, &c., along with India) amounted to 28,555,394 lb., of which 28,041,096 lb. came from the Straits Settlements.

Internal.—It is impossible, in considering internal trade, in pepper, to separate that in the Indian and foreign articles, since they are dealt with conjointly in trade returns.

The total registered transactions by road, rail, and river are small, nearly all the Indian pepper being shipped from Madras coastwise to the large centres of demand. Thus, in 1888-89, they amounted to only 80,114 maunds, valued at R2,713,393. Of this amount Madras seaports exported 5,373 maunds; Madras Presidency, 6,629; Bombay Port, 19,973 maunds; Bombay Presidency, 2,868; Calcutta, 32,149 maunds; Bengal, 3,263; and Karachi, 8,769 maunds. The largest importers were Bengal with 36,152 maunds; the North-West Provinces and Oudh with 9,700; the Punjab with 9,489; and Madras with 7,173. It will be seen from these figures that the trade results almost entirely from the distribution of European and Madras pepper from the large seaport towns, to the various inland provinces.

The coastwise trade in Indian pepper, which represents the first stage in this distribution, is fairly large and important. In 1889-90 the total imports into all ports amounted to 10,539,676 lb., value R3,924,141, of which 5,083,211 came from Madras District Seaports, and 1,373,699 from Travancore. The largest importing provinces were Bombay with 5,151,036 lb., and Bengal with 2,402,562 lb. Madras, Sindh, and Burma received smaller amounts. The coastwise trade in foreign pepper is included in the general class of "spices," and cannot be given separately.

External.—Notwithstanding the fact brought out in the previous *resume* of the history of Indian trade in pepper, namely, that this country, once the centre of supply for the whole world, has been to a very large extent supplanted by the great development of Malayan trade, it is encouraging to note a considerable and steady increase in the exports from India during the past twenty years; and not only has the quantity exported increased, but the proportionate value has risen to a marked extent. The averages during the past fifteen years have been as follows:—

Quinquennial period.		*lb.*	*R.*
1875-76 to 1879-80 ..	..	5,420,963	977,924
1880-81 to 1884-85 ..	..	5,961,098	1,220,083
1885-86 to 1889-90 ..	..	7,652,334	2,891,805

In 1889-90, the total amounted to 8,249,100 lb., of which Madras exported 6,154,380; Bombay, 2,078,131; Sind, 9,244; and Bengal, 7,345 lb.—probably all received from Malabar by coastwise traffic. The distribution of these exports during the past three years may be shown by the following table:—

Importing Countries.			*1887-88.* *lb.*	*1888-89.* *lb.*	*1889-90.* *lb.*
United Kingdom	..	..	830,361	898,309	869,827
Austria ..	..	..	..	11,200	33,600
Belgium ..	..	..	39,200	78,400	44,800
France ..	..	..	3,763,914	4,692,830	4,049,238
Germany	..	..	75,824	229,376	377,948
Holland ..	..	..	..	..	33,600
Greece ..	..	..	5,488	4,480	..
Italy ..	..	..	509,600	305,172	450,900
Malta ..	..	..	..	11,592	..
Turkey in Europe	..	..	6,944	..	..
Russia ..	..	..	10,528	..	67,200
Abyssinia	..	..	5,320	3,024	12,655
East Coast of Africa	Mozambique		7,112	6,188	11,151
	Zanzibar		73,885	59,521	99,365
Egypt ..	..	..	313,292	223,083	271,426
Mauritius	..	..	19,712	41,552	32,504
Natal ..	..	..	5,656	8,204	18,788
United States	..	..	63,000	14,860	..
Aden ..	..	..	321,972	223,649	287,196
Arabia ..	..	..	352,526	280,601	269,476
Ceylon ..	..	..	36,774	19,030	76,348
Mekran and Sonmiani		..	3,572	3,716	5,026
Persia ..	..	..	275,470	227,139	717,713
Turkey in Asia	..	..	397,018	320,969	518,129
Australia	..	..	23,800	..	..
Other countries	..	..	5,268	3,112	2,210
Total		..	7,146,236	7,666,007	8,249,100

The imports from foreign countries are, on the coutrary, steadily decreasing. During the past fifteen years the averages have been as follows :—

Quinquennial period.	*lb.*	*R.*
1875-76 to 1879-80	7,322,176	1,381,545
1880-81 to 1884-87	4,705,934	1,103,452
1885-86 to 1889-90	2,816,798	1,043,673

In 1889-90 the imports were, however, considerably above the average, amounting to 5,707,147 lb., value R2,004,850. Of this 5,649,629 lb. were received from the Straits Settlements, and unimportant quantities from Ceylon, Zanzibar, Java, and other countries. The largest importer was Bengal with 3,828,400 lb., followed by Bombay with 1½ million lb., Burma and Madras with insignificant quantities.

The re-export trade is small and unimportant, but, like the export trade, has increased to a slight extent during the past ten years. In the five years ending 1884-85 it amounted to 79,699 lb., valued at R19,569, while in a similar period ending 1889-90, it attained the quantity of 119,123 lb., value R47.763. In 1889-90 the re-exports were 141,817 lb., valued at R56.057. Of this amount 52,416 lb. went to China, 20,081 to Mauritius, 17,920 to Persia, and insignificant quantities to Cape Colony, Australia, Natal, Egypt, and other countries. The largest re-exporting province is Bengal, which shipped 103,278 lb. out of the total.

ALLSPICE, PIMENTO, OR JAMAICA PEPPER.

(*Myrtus Pimenta—Eugenia Pimenta—Pimenta vulgaris.*—MYRTACEÆ.)

(*From "Cultural Industries for Queensland" by Lewis Adolphus Bernays*, F.L.S., F.R.G.S.)

A native of South America and of the West Indies especially of Jamaica, whence the principal supplies of all spice are derived. The *Eugenia Pimenta* is an exceedingly handsome tree, attaining under suitable conditions of climate a height of at least thirty feet. It has a smooth trunk with shiny green leaves something like those of the "Bay." The foliage is very luxuriant, and as the tree branches equally all round, the effect is very handsome, especially in the contrast presented between its profusion of small white flowers and rich green leaves. It affects hilly situations, and will grow on barren land unfit for any other cultivation. Porter instances a fine specimen standing on the ridge of a rock about twenty feet in circumference, and eight feet from the surface of the ground, the roots encompassing the whole surface of the rock, and finding their way down to the soil whence the tree derived its nourishment.

The pimento is said to be very impatient of all attempts at entirely artificial cultivation where the tree does not grow spontaneously, very few of the efforts made to propagate young plants, and grow them into trees by the ordinary methods of cultivation, having been successful. Experience of the tree in Queensland is very limited; the only specimen known to the writer being one on a hill-side Brisbane Botanic Gardens. This tree is some fifteen years old, and about twenty feet high. I cannot learn how long it has been bearing; but last season it yielded a small crop of sound healthy berries—a fact sufficiently encouraging to induce attempts at cultivating so useful a tree. The following is the principal method of cultivating the Pimento-tree in Jamaica:—A selection is made of land where the natural vegetation is, interspersed with these trees, or in the immediate vicinity of an old plantation. The whole of the other timber and undergrowth is cut down and left to decay, the Pimento-tree alone being allowed to remain intact; among the ruins of the other timber, the young Pimento plants spring up in profusion where the seed has either fallen or been deposited by birds; the prostrate branches of the felled trees affording a valuable protection to the tender plants. In due course these are thinned out; and, when in two years' time the dead timber and rubbish is cleared away, the young trees are free to grow to maturity, and the plantation, thus curiously created, is thenceforth tended in the usual way, the trees arriving at maturity in about seven years,

The Pimento flowers twice, but only bears a regular crop once a year. The fruit is a small berry, somewhat larger than a peppercorn, and containing two seeds, and when ripe is succulent and of a black or dark-purple colour. The produce is variable in quantity, but a good tree, under favourable conditions of season, will give a hundredweight of the dried spice; the loss in drying being about one-third of the weight of the freshly gathered berries.

If the berries are left to ripen they become moist and glutinous, difficult to cure, and not only lose their pungency and delicate aroma, but acquire a different flavour somewhat resembling juniper berries. The fruit is, therefore, gathered while still green, and is either sun-dried on mats or terraced floors, or cured by a more rapid process in kilns. Curing in the sun takes, under favourable circumstances, about seven or eight days. During the process the heaps are frequently turned and winnowed; great care being taken to preserve them from either rain or dew. Drying constitutes the sole process of preparation for market; and when this has been properly done, the article is ready for packing and export. It will happen that some of the ripe berries get mixed with the unripe, but this is avoided as much as possible; and for the reason that, in exact proportion as this occurs, the value of the commodity is injured, the berries are gathered nearly as soon as they are formed, and before they have begun to mature. When sufficiently cured they present a rough exterior and a dark-brown colour, and the seeds rattle inside.

The common name "Allspice" is derived from the idea that Pimento combines the flavour of cloves, cinnamon, nutmeg, and pepper.

The aromatic properties of the fruit are contained in a volatile oil, the dissipation of which, as the fruit matures, accounts for the necessity for securing the crop while still green. The aromatic and pungent qualities reside principally in the external skin of the berry; but the same properties, in less degree, are found in every part of the plant. Alcohol extracts the entire virtues of the berry; but the aroma, and some part of the astringent and pungent principles, are extracted by water. The chief use of allspice is in cookery. In medicine, however, it is found in various forms of heavy and light "oil of pimento," in "spirit of pimento," and "pimento water." Its medicinal properties are very similar to those of cloves, being a warm aromatic stimulant and carminative, relieving flatulency, stimulating and giving tone to the stomach, and promoting digestion. It is also used in common with some other of the spices, as a cover for medicines of unpleasant flavour, and to prevent the griping of purgatives.

The oil, obtained by distillation with water, when coloured with Alkanet root *(Anchusa tinctoria)* is commonly sold as oil of cloves, although by no means possessing the full properties of the latter.

Simmonds states that Pimento is also used in tanning, and that a patent has been taken out in Jamaica for employing the leaves as a tanning material; but this is not supported, and, if true, possesses little interest in Queensland, where superior tanning-producing material is so abundant. One other use of the tree remains to be enumerated—namely, that of being convertible into good walking-sticks and umbrella-handles.

According to *Scientific American*, the umbrella trade threatens the existence of the Pimento plantations of Jamaica. It was shown by an official estimate made at Kingston, last autumn, that more than half-a-million of umbrella-sticks were then awaiting export to England and the United States. These sticks were almost without exception Pimento, and it is not surprising that owners and lessees of Pimento walks are becoming alarmed at the growth of a trade which threatens to uproot in a few years all the young trees. The export returns for the last five years show an average of 2,000 bundles of sticks sent out from Jamaica annually; and the returns for the first three quarters of 1881 show an export of over 4,500 bundles, valued at 15,000 dollars. Each bundle contains from 500 to 800 sticks, each of which represents a young, bearing Pimento-tree.

But, apart altogether from its commercial value, the Pimento-tree is a very desirable addition to our gardens. Even as a shrub it is beautiful for its ornamental, bright foliage; and when planted in a clump, the slightest breeze will fill the air with a delicious perfume exhaled from the leaves. These latter when bruised yield an aromatic odour nearly as strong as that of the fruit; and, judiciously used by the cook, and in connection with the domestic medicine chest, may serve many of the purposes of the spice, and render the possessor of a tree, so far as his household is concerned, independent of its fruiting.

Edwards, in his history of the British West Indies, says:—"I do not believe there is in all the vegetable creation a tree of greater beauty than a young Pimento. The trees form the most delicious groves that can possibly be imagined, filling the air with fragrance, and giving reality, though in a very distant part of the globe, to our great poet's description of those balmy gales which convey to the delighted voyager—

"Sabean odours from the spicy shore
Of Araby the blest—
Cheered with the grateful smell, old Ocean miles."

The seeds of the Pimento-tree are very perishable, and have proved difficult to import; and the number of plants brought to Queensland has been hitherto small. As, however, the seeds borne by the specimen in the Brisbane Botanic Gardens germinate freely, plants will be available henceforth without the risk and trouble of importation.

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